the OIL AND GAS JOURNAL
JUNE 2, 1958

Exploration Highlights
p. 199

Phillips Cracks World's Drilling-Depth Record

. . . and is drilling ahead in West Texas below old record of 22,570 ft. p. 63

BUTADIENE: A Postwar Giant That Has Grown Too Fast p. 66

How Fuel Makeup Affects Car Pickup p. 90

So you've decided to install

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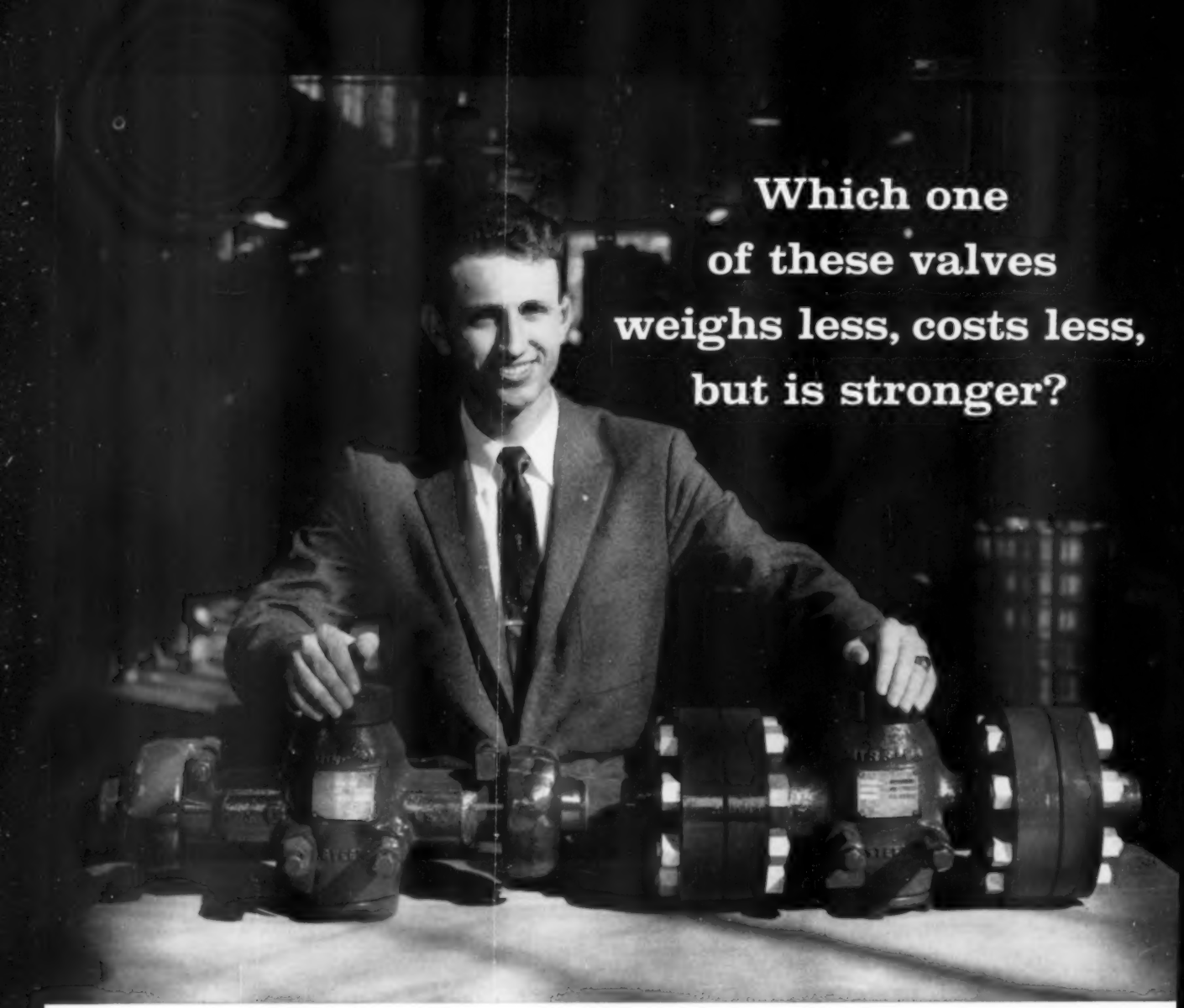
Exclusive Interview

FPC's W. R. Connole Explains His Views on Regulation p. 70

ONE DOLLAR PER COPY



Which one of these valves weighs less, costs less, but is stronger?

Both of these valves are of the same make, model, size, and pressure rating. One is equipped with 2", 6000 lbs. test, Unibolt Couplings, the other with 2", Series 900 flanges. The Unibolt-equipped valve weighs 102 lbs. less, costs about 10% less, and is approximately 28% stronger!

And the advantages don't stop there. Because it weighs less, the Unibolt-equipped valve costs less to ship and is easier to handle, easier to install. (Two bolts and nuts, compared to 16 bolts and 32 nuts.)

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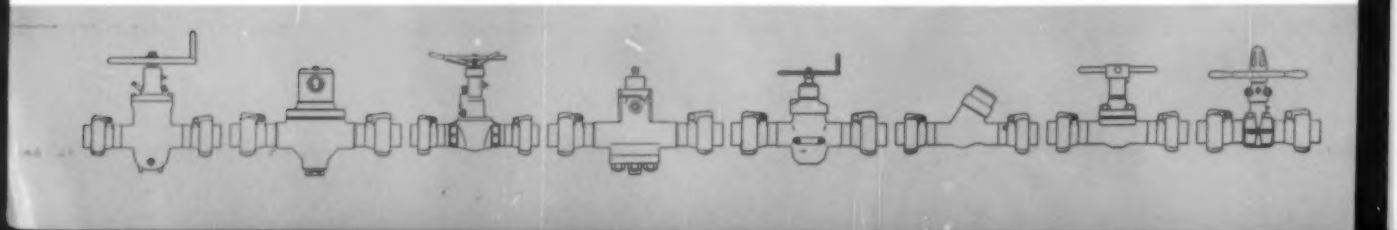
ask your supplier to furnish unibolt-equipped valves



the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
June 2, 1958

Phillips has a new world's drilling-depth record:

The 1-EE University in Pecos County, Texas, is heading toward 23,000 ft. (p. 63).

It passed the record 22,570 ft. last week, still 2,000 ft. from its prime objective, the base Ellenburger. Well is still in the Montoya-Silurian-Devonian just above the Simpson.

The monumental drilling job has been costly, the geology tricky, and the drilling tough. Phillips geologists are still hopeful of hitting a deep pay.

Drilling industry is operating at 52% of capacity.

With roughly 3,400 rigs available in the U. S. only 1,792 were running at midmonth. This means that half of a $700-million investment is idle.

These figures were given at a Dallas meeting of drilling contractors by C. L. Vickers of Continental-Emsco. He says the industry must operate at 75% of capacity to break even (p. 84).

He warns not to expect demand for rigs to equal availability of equipment any time in the near future.

Oil marketers have a stake in a new FTC examiner's ruling that dealer price allowances to station lessees are illegal.

Examiner in a Sun Oil case held that a discount given to a lessee by his supplier in order to meet competition in a price war violates the Robinson-Patman Act.

Sun plans to fight the case. If ruling holds, it will affect the relationship of all suppliers to their lessee dealers.

Indications are the FTC may uphold the examiner.

Hint of a shift in FTC thinking on this subject was given by Chairman Gwyne before a Senate committee hearing. He says FTC now considers voluntary price allowances are not covered by the Detroit case.

The reasoning: The allowances are not given to meet the supplier's own competition but to meet competition of the dealer, an independent businessman.

Sun Oil attorney attacked this line of reasoning in his argument before examiner. His contention is you can't sepa-

rate the competition of the supplier and dealer. It's the same.

Ikard's plan for mandatory quotas on oil imports now apparently has been killed in the House.

Domestic oil producers instead have been offered an expanded national-security clause in the foreign-trade bill. The clause would require the mobilization director to consider the outlook for domestic exploration and development in determining if imports threaten national security.

Showdown on the issue comes this week when the House takes a series of votes on the trade bill. (p. 68).

Oil-company earnings are off 32.2% in first quarter.

Profits of 48 companies compiled by Carl H. Pforzheimer & Co. total $751,430,000 in first 3 months, a far cry from last year at the same time when earnings set a record.

Four firms—Arkansas Fuel Oil, Shamrock, Kentucky Standard, and Monterey—held just about even with a year ago. Tidewater, with earnings of 1 cent a share compared with 85 cents a share last year, was worst hit.

Pforzheimer prediction: Downward trend may bottom out in current quarter and seasonal improvement in demand could be reflected in higher industry operations and earnings in the second half.

Exploration spotlight in the Rockies is shifting to the Wyoming basins of the Green, Wind and Powder rivers and to the Denver basin.

New wildcats in the Green River basin are announced for area north of the western flank gas fields on east side. The target is the Mesaverde-Cretaceous.

Wind River area will see deep tests with new interest being turned to Dubois region on the northwest side.

Central Powder River basin also will see a new plan for the Mesaverde.

Denver basin, meanwhile, is going strong. Recent Colorado discoveries at Bijou, West and North Bijou, and at Allchin in western Nebraska have stimulated a brisk campaign. Latest new programs are a 5-well wildcat series by Strain Drilling Co. and Tom Vessels and a 10-well program for this summer by Verde Enterprises.

New gas producer for Pescadito salt dome in Southwest Texas is virtually assured.

Well flowed an estimated 1,700 M.c.f. of gas daily on test at 6,808-52 ft. It is nearly 2 miles southwest of the newly completed discovery which produced at rate of 9,000 M.c.f. daily during completion tests.

Another extension and a promising new pay have been

added to Alberta's prolific Waterton Park-Castle River gas field (p. 78).

Texaco Exploration Co.'s B6-17 Castle River flowed 14,000 M.c.f. of gas daily from the Devonian D-1 pay topped at 12,985 ft. The well also is an indicated producer from the Mississippian, the established pay in the field.

The B6-17 Castle River is 3 miles northwest of Texaco's Castle River discovery and 17 miles northwest of Shell's 2 Waterton Park, southeastern limit of the big structure.

Cities Service is moving into Italian mainland primed for a full-scale exploration program.

Always intrigued by Italy's possibilities in spite of Gulf's disenchantment with government red tape, Cities Service is opening a geologic office in the country.

The company has interests in about 900,000 acres in southeastern Italy. This stretches from the "spur" which juts into the Adriatic down to the "heel" itself.

Russian-made equipment already has been put to use in Egyptian oil fields seized by Nasser's General Petroleum Co.

Russian technicians are now training Egyptian crews to use other Russian-made equipment. Special training site has been set up near the west coast of the Gulf of Suez. The equipment is being supplied under a 5-year Soviet-Egyptian economic aid agreement.

The Egyptian deal is part of a Soviet pattern to expand its influence in world oil.

Other credits totaling many millions have been extended for storage, pipeline, refinery, and drilling projects in Afghanistan, India, and Syria.

Mark up one gain from lowered allowables and price adjustments in Texas.

A large independent in the Corpus Christi area reports he's had inquiries for long-term contracts for field condensate.

This is a real switch. Says the operator: "Only 3 months ago, I couldn't give it away."

Interesting findings on oil recovery by in situ combustion have been turned up in Amsterdam by Royal Dutch-Shell (p. 129).

Lab tests with fire recovery show:

...Oil actually does travel forward in a bank.

...Combustion temperature is low—about 300° C.

...Flame actually doesn't form. Spaces between the grains of sand are too small. But the reaction between oil and air nevertheless is sufficiently energetic for combustion process to be self-sustaining.

...Recovery is about 50% of oil originally in place. Between 10 and 20% of oil is burned underground.

Shell is participating with other companies in fire drive tests in a California field. Similar tests also are under way in the Mid-Continent.

Aramco plans a field test of interest to pipeliners. Company will test wrap about 28,000 ft. of 14-in. transfer line with polyethylene tape and the rest of the line with asphalt P-2 coating.

Aim is to check out claims for the rival coatings under Arabian service conditions (p. 93).

Gulf Coast refiners are keeping an eye on one competitor who is importing gas-oil as a cat-cracker charge stock.

The refiner reportedly isn't sure he can get an import quota for crude and is bringing in unfinished gasoline to win at least some of the advantages of importing.

Result may be increased clamor from refiners operating on domestic crude for firmer controls on products imports.

Imports Boss Carson, however, insists there's no problem in products imports.

He told Rocky Mountain oil men that 86% of such imports are residual heating oils. He asserted that refiners in Districts 1-4 simply don't make enough residual to meet the demand.

Carson also said the ratio of imported products to domestic products is only 1%.

U. S. has far too much butadiene capacity. Petrochemical industry currently is using about 56% of capacity. This is due largely to depressed sales of autos, tires, other auto parts and accessories.

Even an upturn, however, won't send production of synthetic rubber to plant capacity. Experts now estimate that butadiene capacity will exceed U. S. and world demand for the next 7 years (p. 66).

Refiners will have some good news this week.

Group 3 gasoline prices are moving up. The market is firming up in reaction to weeks of production cutbacks.

At least two refiners have notified customers along the Great Lakes Pipe Line that prices will advance one-half cent a gallon effective June 2. Others are expected to follow.

Mergers are in the news. Texaco will swap $241.5 million of its stock for assets of Seaboard Oil this week in one of industry's biggest deals...Texas Pacific Coal & Oil will acquire assets of Rowan Oil, Fort Worth, in a $9,639,000 stock deal...Jersey Standard is exchanging 9 shares of its stock for 10 of International Petroleum. Company also is still reported dickering for Hancock (p. 80).

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OLIVER

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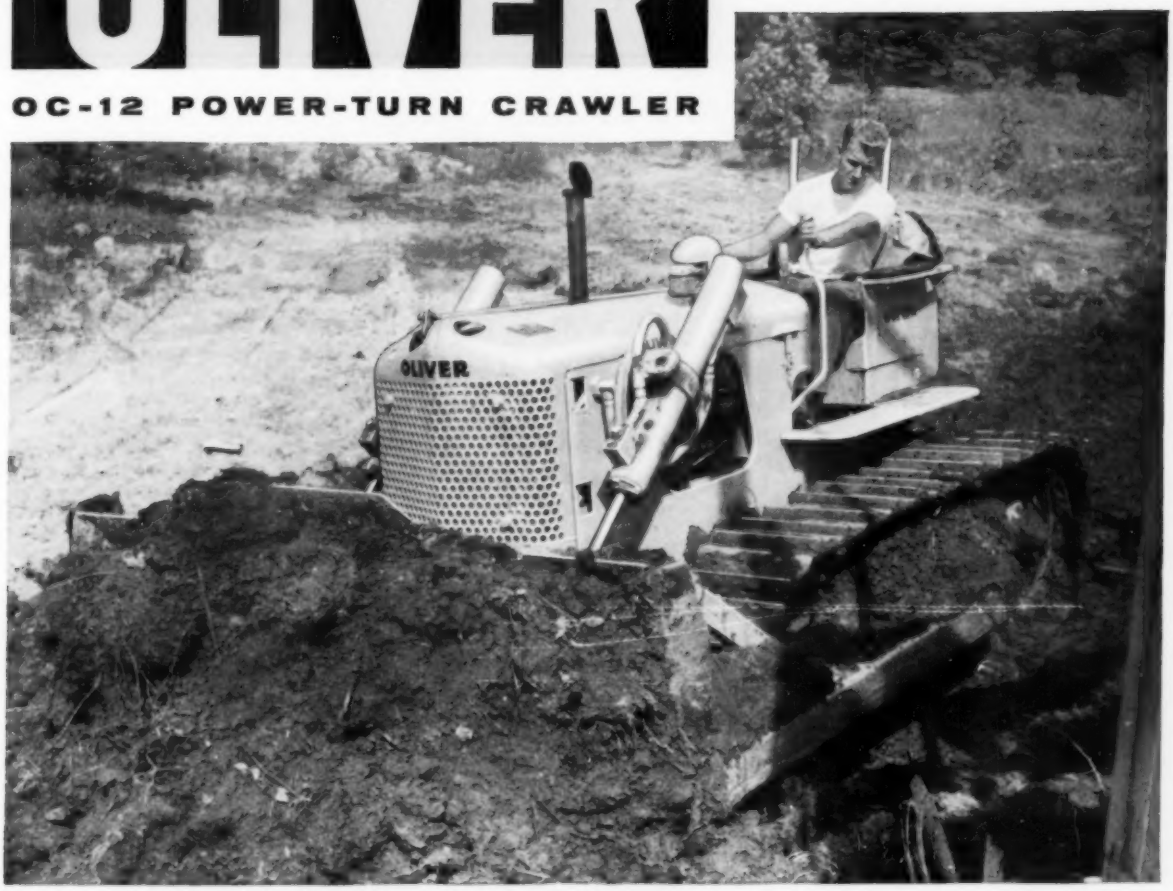

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TECHNOLOGY–OPERATION

Refining-Processing

How Fuel Makeup Affects Car Pickup 90
By O. C. Bridgeman and E. W. Aldrich

Acceleration performance appears to improve steadily as the ASTM 50% point temperature decreases, at any given low ambient temperature. Too low a 50% point evidently can result in loss in performance quality at the higher ambient temperatures during the day.

A Different Dehydration Plant 102
By F. Zapffe

This glycol plant, designed to supply 7-lb. gas at 600 psig. to Natural Gas Pipe Line Co., has the feature of being able to regenerate the glycol in an atmospheric pressure still. The Lone Star Gas Co. plant is in southern Oklahoma.

Refinery Construction Index 105

Considerations in Selecting Air-Cooled Exchangers 106
By E. M. Cook and P. S. Otten

Here is a summary of the information needed to make an intelligent selection of air-cooled heat exchangers. Air vs. water-cooling considerations, mechanical specifications, and other important points are covered.

Tower Moved in Record Rail Haul 122

More on SBA Acetylene 125

Either natural-gas or liquid-hydrocarbon feed can be handled, with two burner designs developed. Here are some cost estimates when operating on either feed for 20 and 60-million-pound per year acetylene plants.

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Pipelining

Protective Coatings for Buried Pipelines 93
By V. M. Liss and Paul Fetko

Because of low cost, local availability, and generally acceptable properties, the authors believe asphalt will continue to be used for coating of Aramco pipelines in Saudi Arabia. Polyethylene tape will be evaluated.

On The Job . . . Pipelining: External Coating Tests 145

Humble Pipe Line Co. has been conducting a laboratory and field program to evaluate and test external pipeline coatings for 10 years. Results are plotted in terms of deformation tests and cathodic-protection tests.

Drilling-Production

First Composite Tree Installed on Field Producer 96

Foaming Agents Lick Water Zones in Air Drilling 97
By R. M. Reed

Nearly 2,000 ft. of hole were drilled successfully while handling water flows of over 50 bbl. per hour in a Palo Duro basin well. This technique is successful if exposed formations do not slough in the presence of water.

New Compound and Technique for Casing-Joint Thread Lock 116
By M. E. True and W. A. Pitts

A thermal-setting epoxy resin, especially compounded for the application is substituted for thread dope on the joints to be locked. Proved in extended field tests, the method eliminates need for a welder.

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DEVOTION TO DESIGN

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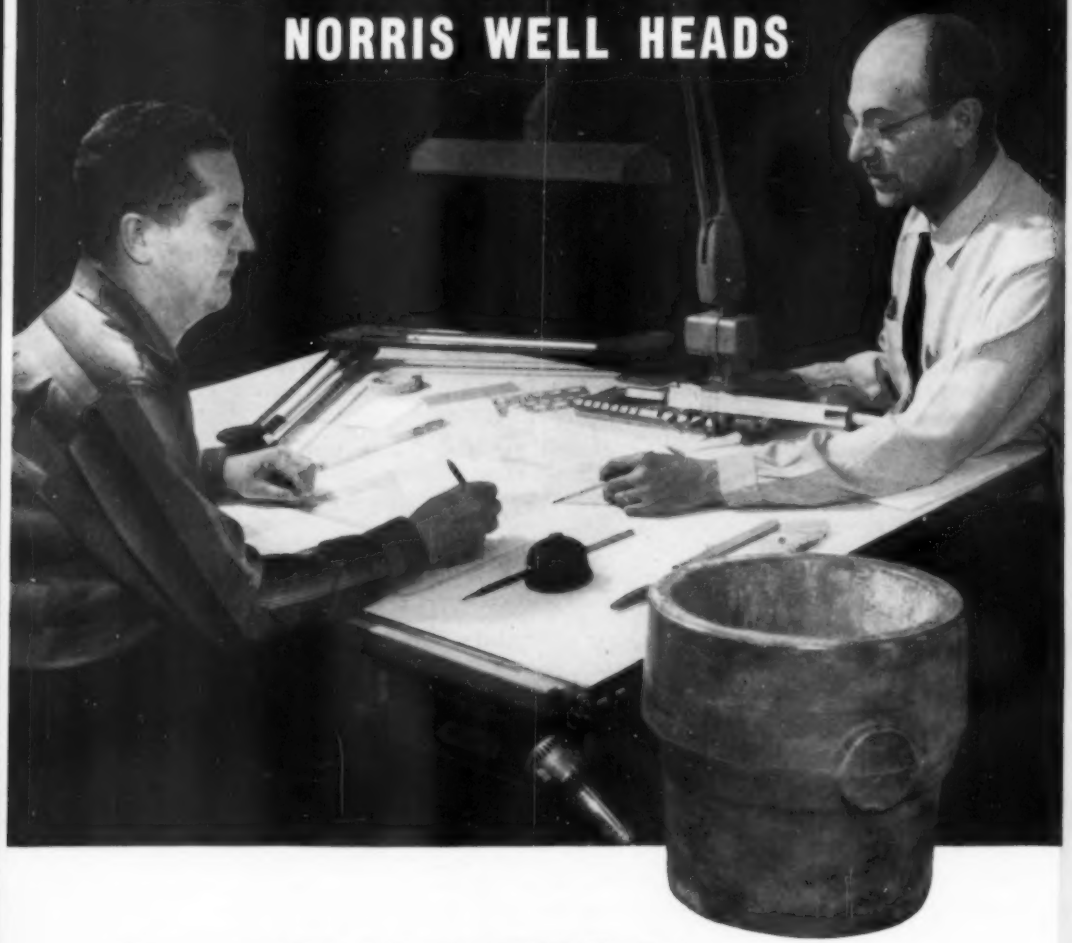

Pressure Ranges Up To 6000 lb. Test

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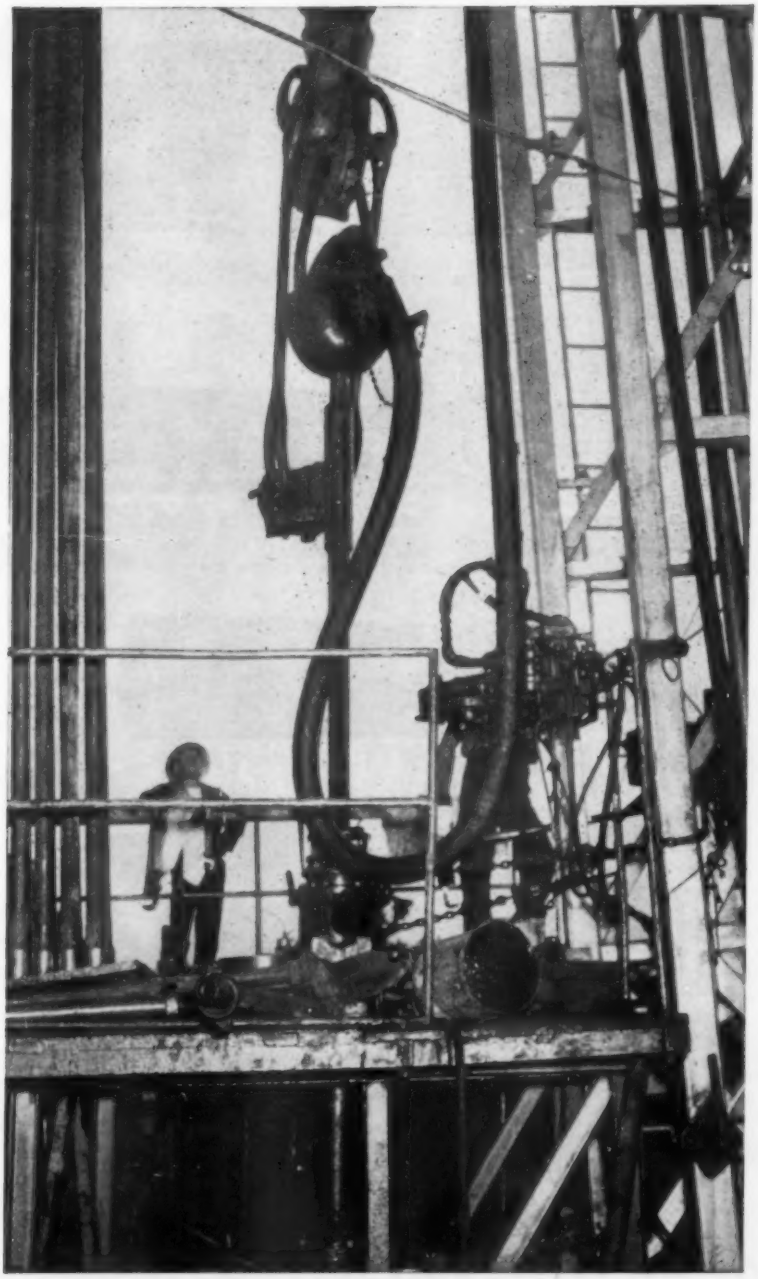
B.F.Goodrich

20% saved when rubber hose replaces steel on workover rig



B. F. Goodrich improvements in rubber brought extra savings

Problem: This special aluminum portable drilling rig is used in servicing wells —cleaning them out, cutting plugs, removing lost iron or steel. Because of the rugged service, a steel rotary hose was used at first. But it was built in sections. Expensive time was wasted in assembling the metal hose every time the rig was put into operation.

What was done: The operators switched to B.F.Goodrich Highflex rotary drilling hose. Spiral wrapped cable wires make this hose resistant to bursts, qualify it for Grade C (5,000 lbs. test pressure) A.P.I. Hose ends are reinforced with additional plies of wire and fabric to protect against bending stress at couplings. Strong as it is, B.F.Goodrich Highflex is still the most flexible hose made for heavy-duty service. It's easy to attach to the rig, hangs well from the standpipe, coils easily without kinking.

Savings: With B.F.Goodrich hose, operators estimate they save 20% in time and labor each time they put the hose into operation.

Extra benefits: This hose is dragged off and on the rig many times, lays in oil soaked mud for long intervals. But after 3 years of service its thick, tough rubber cover still shows no sign of wear. B.F. Goodrich Highflex hose resists gouges, scrapes, tears. Sun, wind and rain will not weaken it. Oily mud will not cause swelling or rotting of tube.

Where to buy: You'll find B.F.Goodrich Highflex hose at leading supply stores in the oil field, or at any of these B.F.Goodrich warehouses: Los Angeles, Great Bend, New Orleans, Shreveport, Hobbs, Oklahoma City, Tulsa, Corpus Christi, Dallas, Houston, Kilgore, Odessa, Wichita Falls. *B.F.Goodrich Industrial Products Co., Dept. M-352, Akron 18, Ohio.*

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Thermoid Oilfield Products

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POWERFLEX ROTARY HOSE . . . is a rugged combination of high-tensile steel cable, heavy-duty fabric and oil-resistant synthetic rubber; bonded together to produce a tough, abrasion-resistant hose that is unrivaled for strength and flexibility. Full-flow steel couplings are securely anchored. Each length is proof tested to 5000 lbs.

TRIOFLEX ROTARY HOSE . . . for slim-hole drilling, is reinforced with high-tensile steel wire braid. Trioflex Hose is extremely flexible and resistant to kinking. It coils in 36" diameter. The tube is constructed of highest quality synthetic rubber, with a tough oil-and-grease-resistant cover that protects the inner sections from wear. Each length is proof tested to 2000 lbs.

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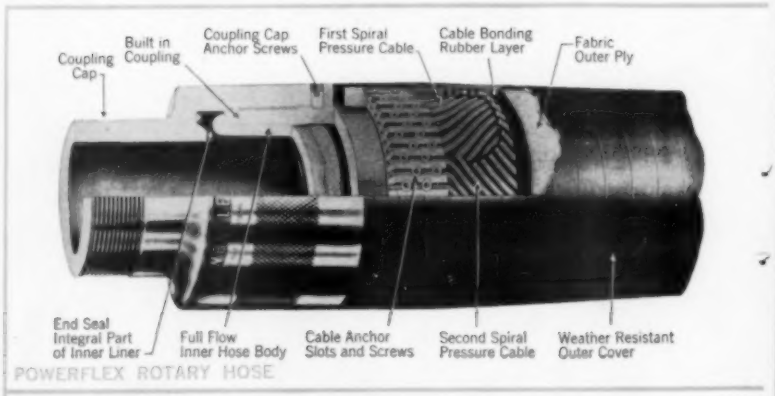
"POWERFLEX" HI-CAPACITY V-BELTS . . . are as much as 40% stronger than standard belts, and reveal far less stretch than competitive belts of equal horsepower rating. These extra advantages eliminate frequent and costly take-ups. They are available in nylon laminated and heavy rayon grommet construction.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Coupling Cap Anchor Screws
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Cable Bonding Rubber Layer
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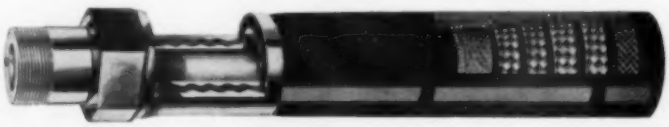
Weather Resistant Outer Cover
POWERFLEX ROTARY HOSE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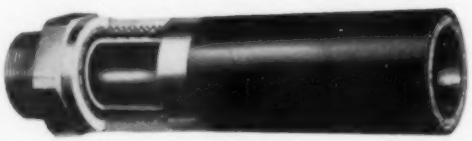
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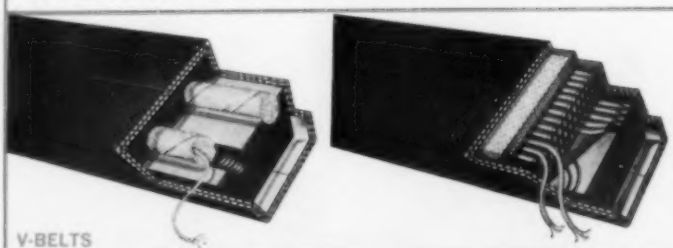
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Ten AAF Cycoils deliver *clean* air to the 660 hp. engines driving pumps at the Ward-Estes Water Flood Project.

AAF Cycoils protect engines—require minimum maintenance

When engines are driving pumps for high-volume water injection used in secondary recovery, down-time means decreased production. That's why only the best protection against dust and dirt is good enough. At the Ward-Estes Water Flood Project, Ward County, Texas, ten AAF Cycoils do the job.

AAF Cycoil oil bath air cleaners require an absolute minimum of maintenance. It is not necessary to tear them down for cleaning. Due to self-cleaning action of the filter pads, the only maintenance needed is the periodic replacement of oil. Records show that Cycoils have been on the job in some applications for as long as 20-years without being dismantled for maintenance.

Cycoils offer many advantages—uniform air delivery, constant efficiency, low operation resistance, minimum maintenance. Get all the facts on AAF Cycoil oil bath air cleaner right away. Write today for Bulletin 130.

AAF
herman nelson

American Air Filter
COMPANY, INC.

444 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

Type CMS Multi-Duty Filters

Type G Pipeline Air Filters

BETTER AIR IS OUR BUSINESS

Type OCH Intake Air Filters

Cycoil Oil Bath Air Filters

what's it worth to dig in close quarters

DAVIS LOADER-BACKHOE

will get you out of a pinch!

CLOSE-IN DESIGN OF DAVIS LOADER — Provides excellent visibility. It packs the power to take big bites. Sturdy box-frame arms have long reach for discharging loads into fill holes, piles, or high-bed trucks. No wonder, Davis is the one others follow.

FIVE-MINUTE DETACHABILITY — Entire Davis Backhoe can be detached in five minutes if you want to use just your tractor for other jobs. Stabilizer feet and boom form tripod so unit is ready for immediate re-attaching.

The exclusive features, superior maneuverability, and wide-range visibility of Davis rigs let you operate under "pinched" conditions impossible for other rigs . . . increase your profit potential by eliminating expensive hand digging!

Visibility to Operate in Tight Quarters — Davis works best in close quarters because you don't have to "feel" your way. Low Loader silhouette, location of seat provides excellent view of where you are working.

Sets Up in Places Inaccessible for Other Machines — Exclusive flush digging and continuous 200° operating arc of the Davis 210 Backhoe lets you operate efficiently in places where you would otherwise have to use expensive hand labor. No other machine could work there.

Alert Controls Permit Precision Operations — Independent controls are mounted in convenient fingertip locations that allow you to always face the job. They respond lightning-fast to your command.

Davis Loaders and Backhoes are available for all popular models of International, Ford, Ferdson Major, Ferguson, Case, Massey-Harris, Allis-Chalmers, Oliver, John Deere, Minneapolis-Moline, and Work Bull Tractors.

SOLD AND SERVICED EVERYWHERE BY BETTER DEALERS

For the name of your nearest dealers write direct. Please specify make of tractor.

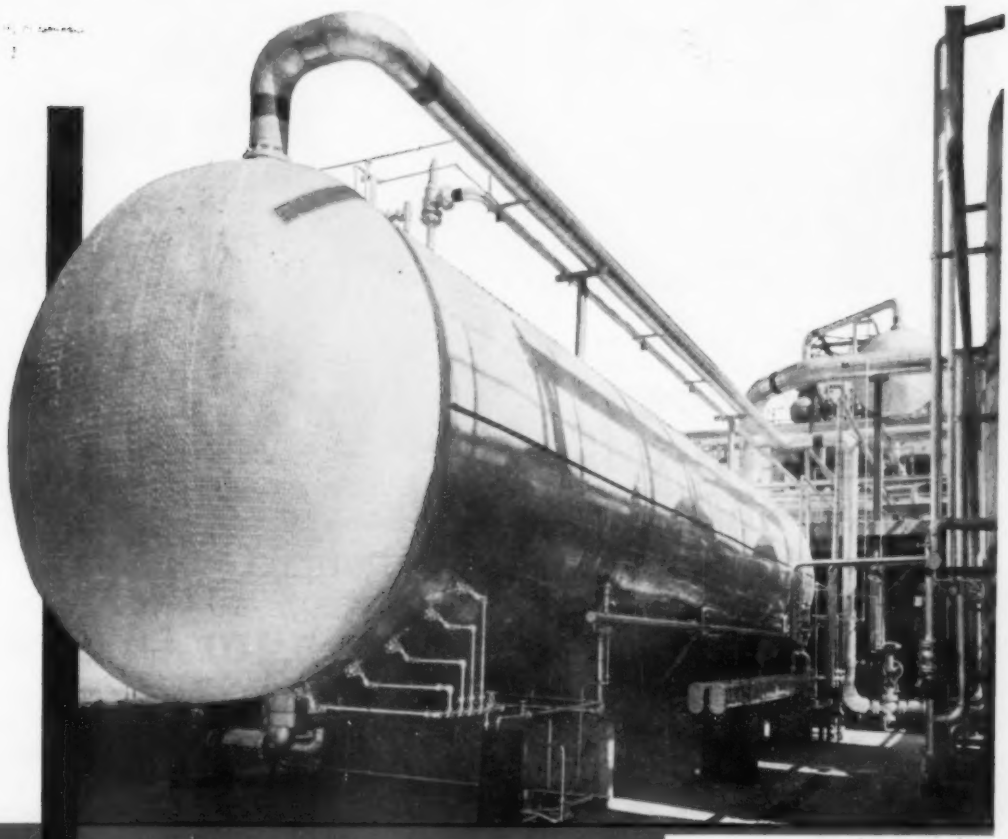
MASSEY-FERGUSON INDUSTRIAL DIVISION

1009 S. WEST STREET • WICHITA 13N, KANSAS

TRETOLITE DESALTING MAKES IT POSSIBLE FOR ANY REFINERY TO CHARGE **ANY** CRUDE

when you specify desalting, remember these facts about Tretolite chemical desalting:

1. 98 to 100% salt removal.
2. Lowest per barrel throughput installation cost.
3. Unsurpassed service organization.
4. A choice of rental or purchase plans.
5. Guaranteed performance.



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DIVISIONS OF PETROLITE CORPORATION

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Your Tretolite Refinery Service Engineer will gladly provide you with cost figures, operating data and complete information. He will arrange for preliminary laboratory tests.

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Chemicals and Services for the Petroleum Industry

DEMULSIFICATION • DESALTING • PARAFFIN REMOVAL
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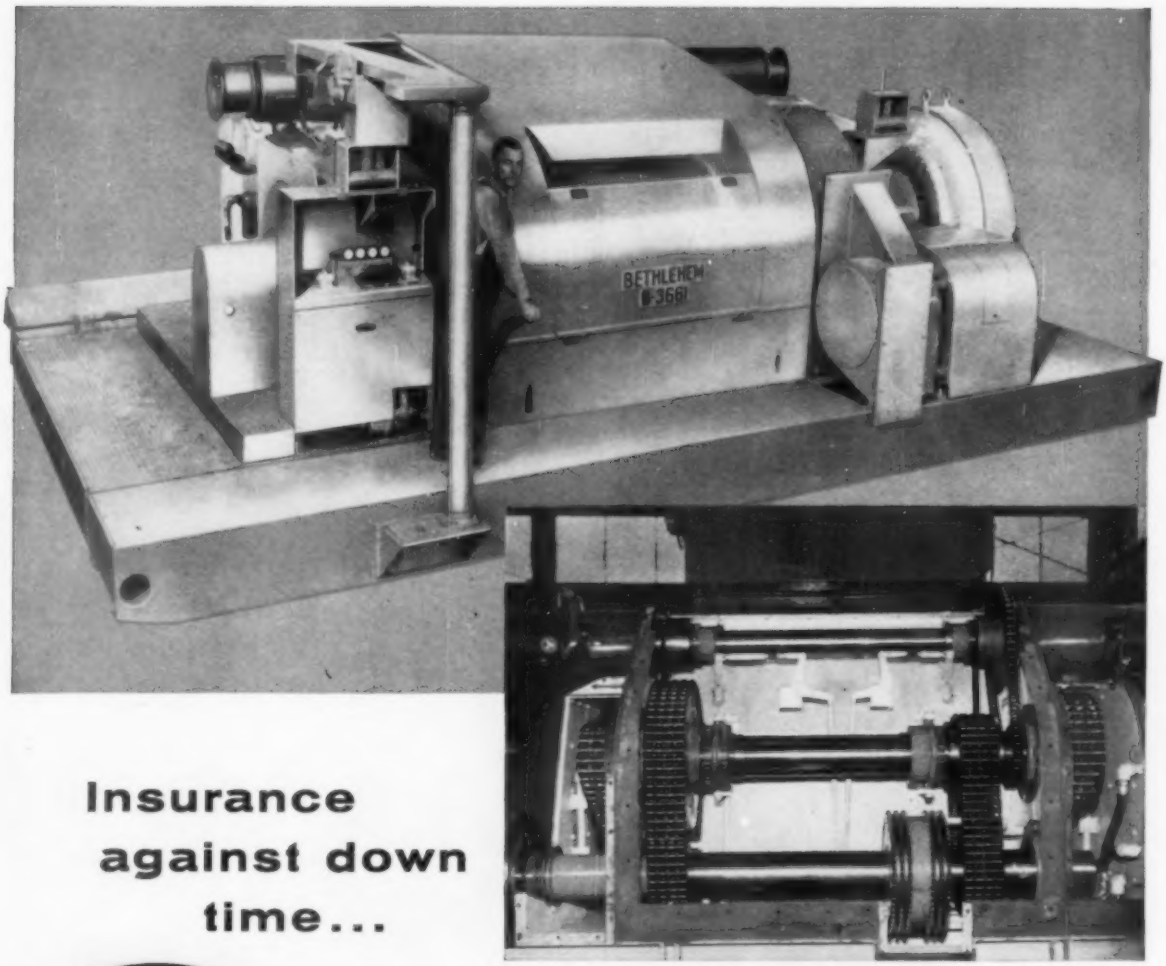
TD-58-3



Insurance against down time...

REX in the Bethlehem Drawworks

The Bethlehem Supply Company B-3661 Drawworks here pictured is equipped with Rex Roller Chain—for one reason. Nothing less than the best of chain is good enough to meet the driller's demand for reliable service, low upkeep and minimum down time.

In appearance, Rex Roller Chain is not too unlike other good roller chains. The design and manufacturing features which result in Rex superiority won't show in a photograph of a chain drive.

For instance, Rex designers have developed a revolutionary system of precision pitch control to equalize load distribution over all parts. Each link plate carries its share of the load.

Link plate holes, too, come in for special attention. A special manufacturing process imparts tremendous strength at these vital points.

And Rex Roller Chain is easy to couple and uncouple because of Rex "Glide-Fit" design.

Whatever your rig, you'll get maximum performance and profit out of it if you specify Rex Roller Chain. See your supply store or your CHAIN Belt Field Sales Engineer. CHAIN Belt Company, 4619 West Greenfield Avenue, Milwaukee 1, Wisconsin.

CHAIN BELT

Milwaukee 1, Wisconsin

Oil Field Offices: Dallas, Houston, Los Angeles, Odessa, New Iberia, Oklahoma City, New York
Export Offices: Milwaukee, New York

THE O·C·T C-20 CASING HEAD

lets you work in *Safety*

Regardless of how or when you decide to install the O-C-T "C-20" Casing Hanger . . . before cementing, after cementing, through preventers, under preventers, or at any time in case of stuck pipe . . . you can improve the safety of your completion operations and save hours of expensive rig time due to the flexible, simplified O-C-T installation procedure.

Let your O-C-T Representative give you all the details or write for complete information. Available through more than 700 supply store locations.

The first quick-setting, positive-sealing well head designed especially to eliminate open hole hazards in medium depth wells, the O-C-T "C-20" Casing Hanger can't forget to seal . . . because the sealing element, slip bowl and slips are assembled as a single unit that may be wrapped quickly around the casing, latched and dropped into place, eliminating the possibility of individual parts being installed incorrectly.

FOR DUAL COMPLETIONS *Specify* O·C·T

The compact Oil Center Tool Company Christmas Tree assembly provides a safe, strong and practical means to economical dual completions.

If you are considering dual completions, it will pay you to check the features and get the full story of this O-C-T Dual Completion Assembly.

where progress is a daily practice

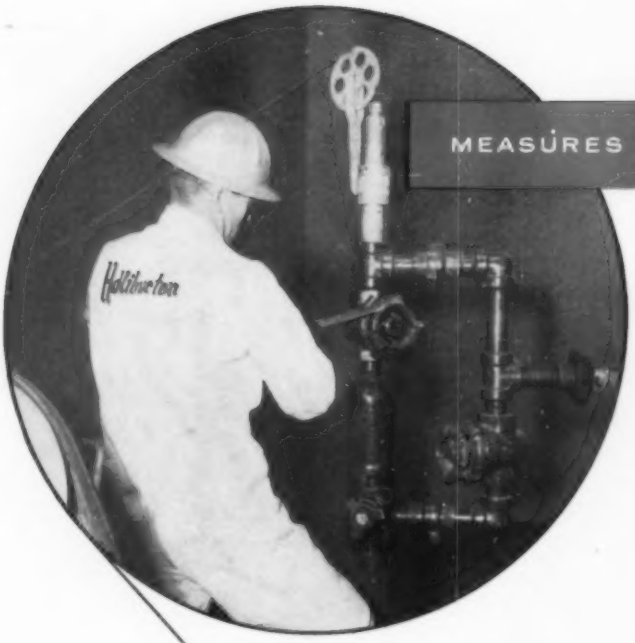
O·C·T

OIL CENTER TOOL CO.

SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

Export Representatives: South America — East West Oiltools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

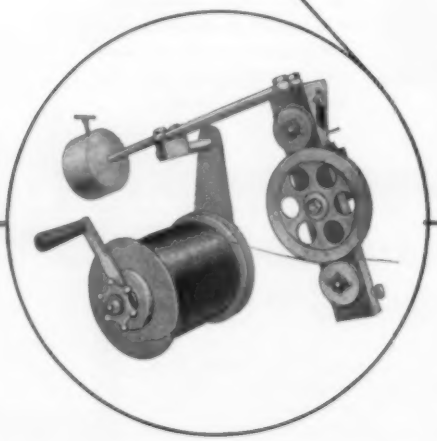
ASK US FOR MORE INFORMATION



MEASURES UP...TO ALL REQUIREMENTS

ADVANCED DESIGN

MEASURING EQUIPMENT *by* HALLIBURTON



STANDARD MEASURING DEVICE

The basic measuring unit for making well measurements and surveys. Reel Assembly is manually operated; may be power driven from rear wheel of automobile. Unit includes a Standard Measuring Head, Counter Balance Assembly, Reel Assembly, 6000 feet of Measuring Line, two weights, wrench, line ring, hook and box.

HALLIBURTON MEASURING EQUIPMENT IS UNEQUALLED FOR ACCURACY, SIMPLICITY AND EFFECTIVENESS

Proof of performance in any product is its successful use in repeated instances over a long period of time . . . and here's another case where continuous improvement and incorporation of the most advanced design keep Halliburton the unqualified leader in Measuring Devices that meet any or all requirements.

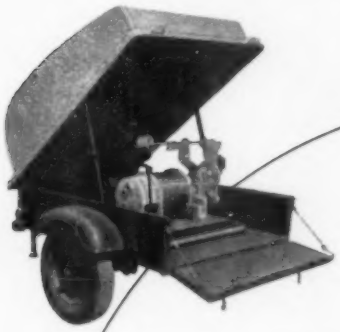
Use any of the variety of types available to give you the accuracy of measurement you must demand to get the best results.

A Halliburton Representative will be pleased to analyze your requirements and help you make your choice, knowing that more than 33 years of uninterrupted quality performance is your guarantee of satisfaction.

284 SERVICE CENTERS...
TO SERVE YOU BETTER

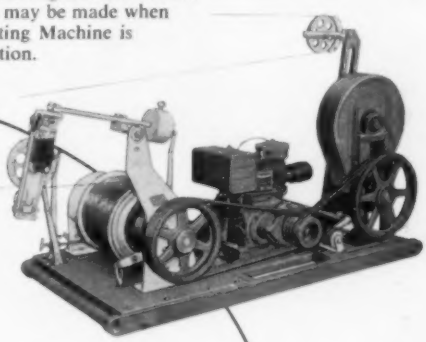
TWO-WHEEL TRAILER

Provides ample space for even the largest Halliburton Power Driven Measuring Assembly. Specially designed for portability over rugged terrain... light all-steel construction. Overall length of 105 inches. Recommended carrying capacity of 1,500 lbs. Metal cover is optional.



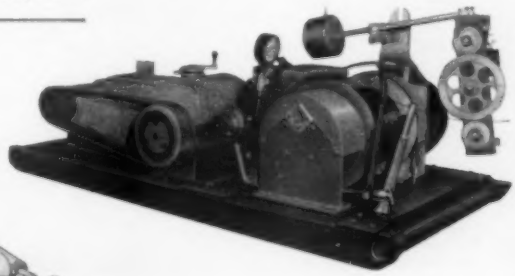
PARAFFIN CUTTING MACHINE

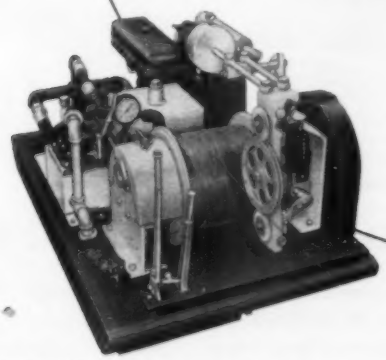
By means of this machine, you can get efficient removal of paraffin from casing or tubing in a producing oil well. Driven by a 6 HP Briggs and Stratton air-cooled gasoline engine. Paraffin cutting stroke action is developed by an oscillating arm, engaged by the idler pulley. Length of stroke is adjustable to give vertical travel from 40 to 61 inches. Paraffin Cutting Machine may be operated simultaneously with the Measuring Device. Bottom hole surveys may be made when Paraffin Cutting Machine is not in operation.

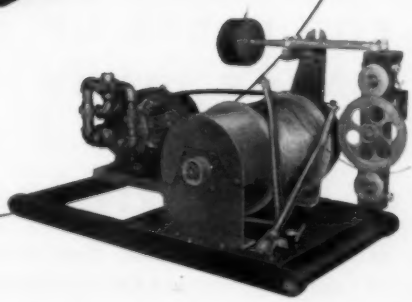


EXTRA HEAVY DUTY ELECTRIC MOTOR POWER-DRIVEN MEASURING ASSEMBLY

Designed for use where alternating current power is available, this Measuring Assembly incorporates a 5 HP, 220-440 volt, 3 phase, 60 cycle uni-closed electric motor. Explosion proof motor is available, if required, at additional cost. A feature of this unit is the mechanical transmission, with three speeds forward and one speed in reverse, for operations where unusually low line speeds or maximum line pull are required.







HYDRAULIC FLUID-DRIVE POWER-DRIVEN MEASURING ASSEMBLY

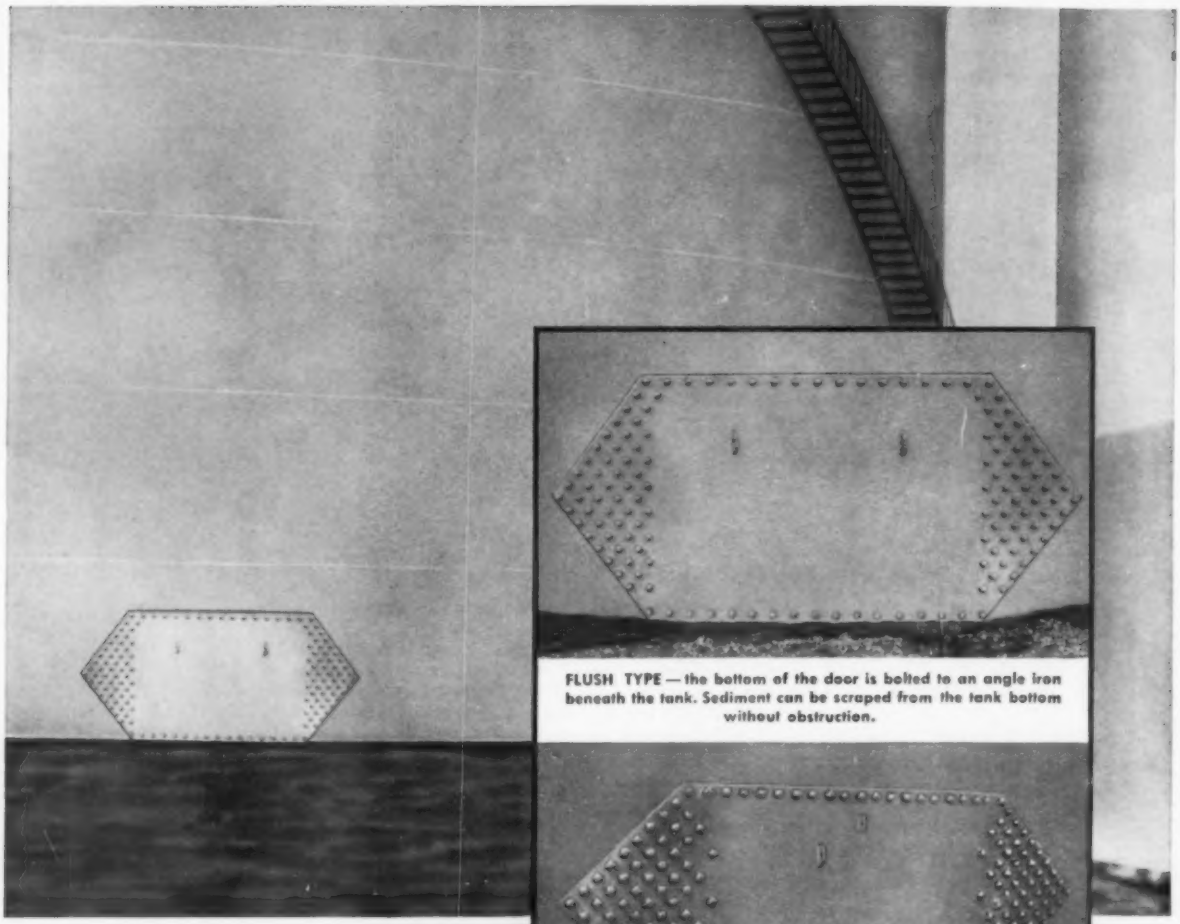
Designed for running bottom-hole instruments in the annulus between tubing and casing. Affords more accurate control of the Measuring Line Reel... Reduces to a minimum the hazard of pulling the line in two when a tool or instrument wraps around the tubing or hangs up when coming out of the cased well or open hole.

AIR-POWERED MEASURING ASSEMBLY

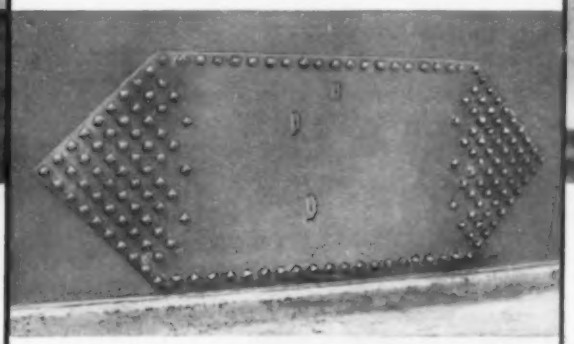
Driven by compressed air for greater safety and flexibility. Especially suited for well requirements where there is a need for high starting torque, accurately controlled variable speed, or where possible safety hazards exist. Powered by radial 5-cylinder air motor, with built-in gear reduction.

HALLIBURTON MEASURING EQUIPMENT

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA



FLUSH TYPE — the bottom of the door is bolted to an angle iron beneath the tank. Sediment can be scraped from the tank bottom without obstruction.



RAISED TYPE—the bottom of the door is bolted to a strip remaining on the supporting plate — similar to the mounting method for conventional riveted doors.

COST-SAVING NEWS FOR USERS OF LARGE TANKS

Two New Bolted Clean-out Doors

Removing sediment from large tanks through riveted doors or small bolted manways is a time-consuming and costly procedure.

Graver has developed a solution that speeds clean-out —the two new large bolted doors illustrated above. Mounted at ground level, the doors can be removed and replaced by regular maintenance crews. Sealing is simple and leakproof. The openings provide ample clearance for clean-out equipment. The doors can be installed in the shop or in the field during tank erection.

Although several features are believed to be unique, Graver has made the designs available to industry without restriction as another contribution toward reducing operating costs.

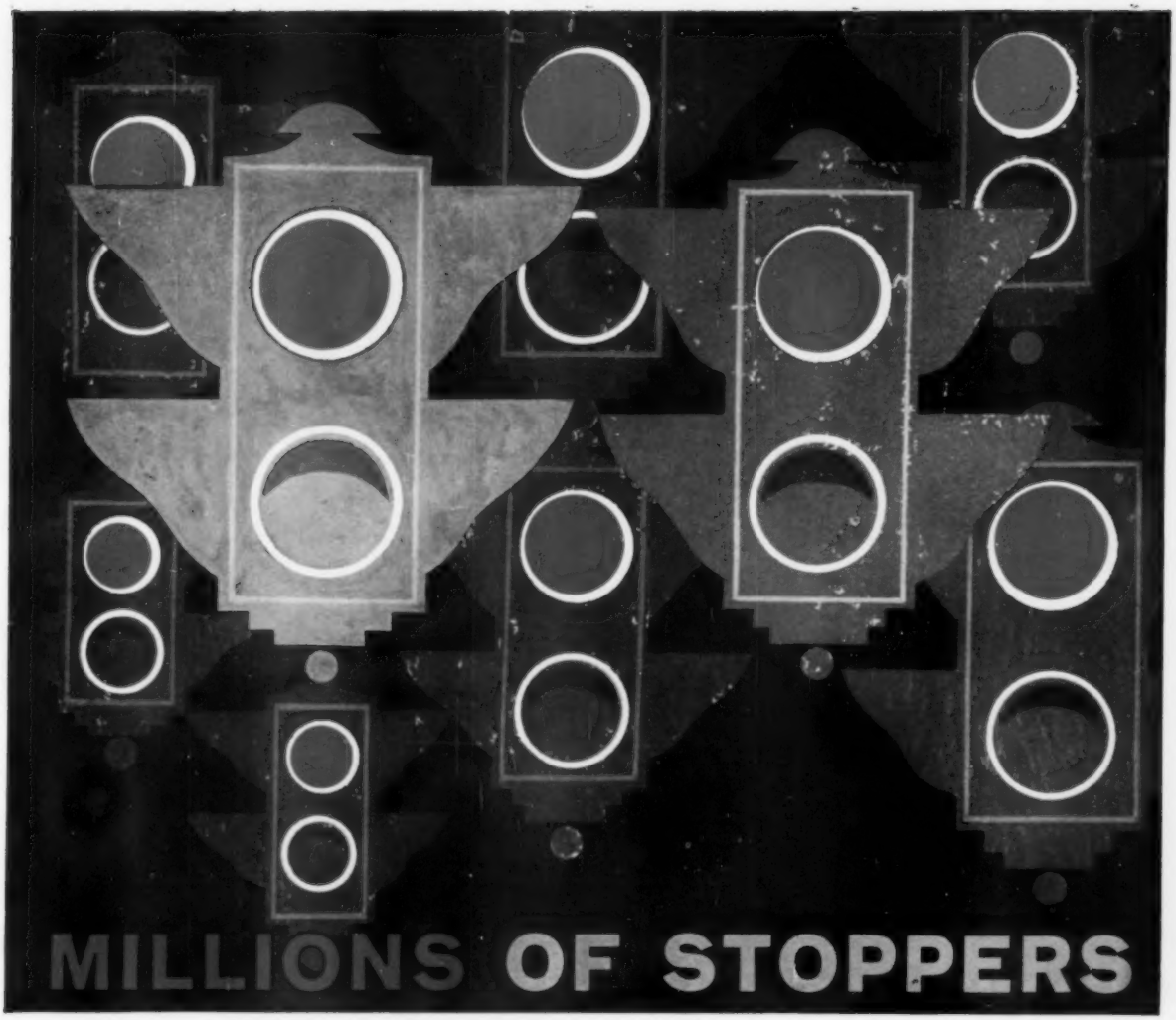
Reducing costs has been one of the primary objectives of Graver research during its 100 year association with the petroleum and chemical industries.

GRAVER®

Building for the Future on a Century of Craftsmanship in Steels and Alloys

GRAVER TANK & MFG. CO., INC.

EAST CHICAGO, INDIANA • New York • Philadelphia
Edge Moor, Delaware • Pittsburgh • Atlanta • Detroit • Chicago
Tulsa • Sand Springs, Oklahoma • Houston • New Orleans
Los Angeles • Fontana, California • San Francisco



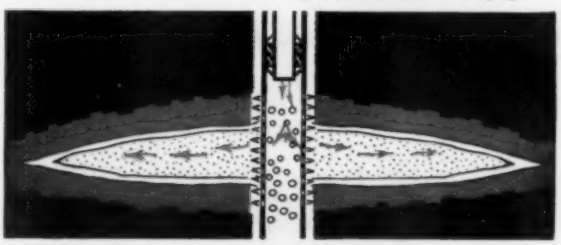
against fluid loss . . . thousands of feet below!

Millions of Adomite particles dispersed in a fracturing fluid act like traffic lights. They control fluid loss . . . stopping it by forming a temporary seal over pores of the rock matrix.

This allows a fracturing fluid to be injected at higher rates under greater pressures for an extended, deeper fracture . . . with minimum sanding out. After an Adomite treatment there is no evidence that the formation has ever been sealed. Consider these other important reasons why more producers are *standardizing on Adomite:*

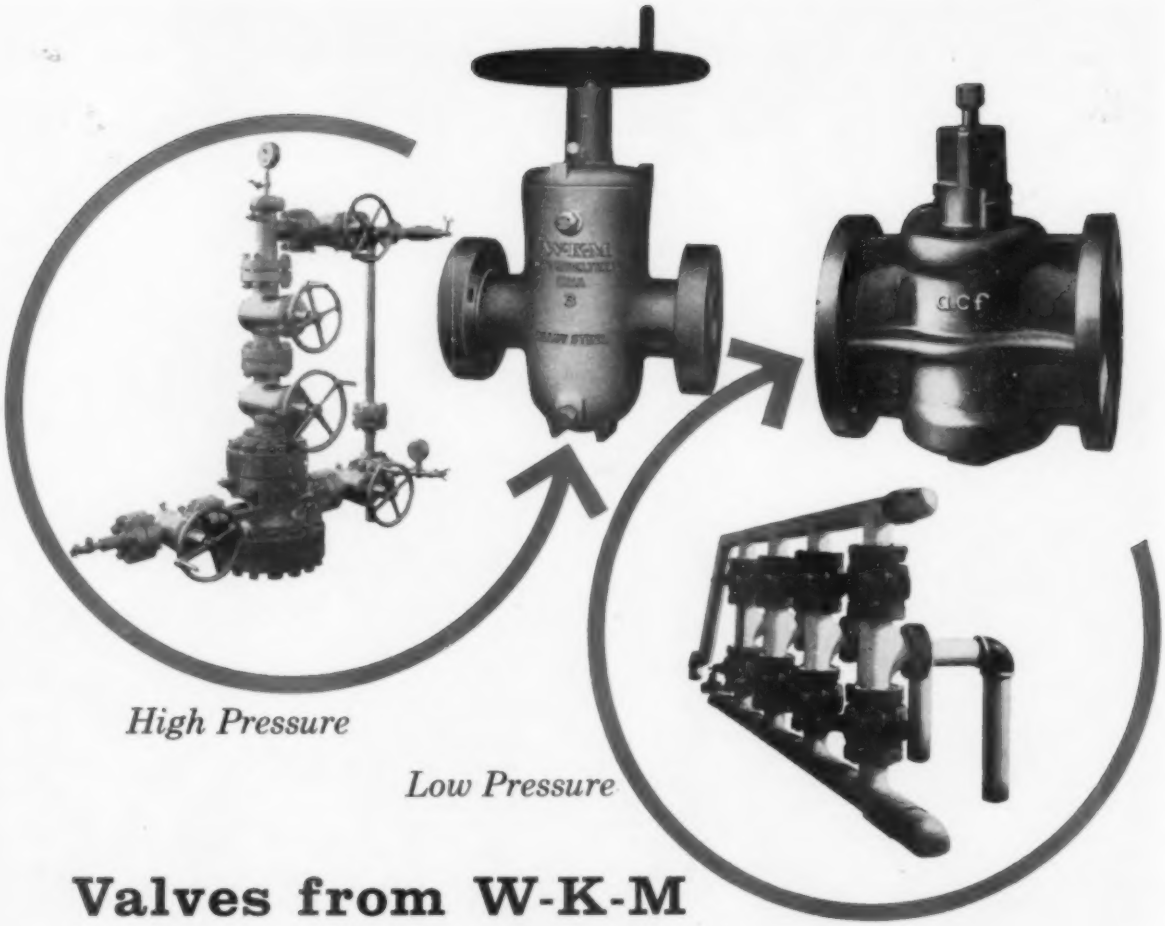
- Obtains larger fractures per volume of treatment, or the same-sized fracture with a lesser volume of fracturing oil.
- Decreases friction loss because of the low viscosity of Adomite-treated fluids.
- Saves transportation costs — because Adomite permits you to use your own crudes.
- Assures acceptance by the pipe line companies for Adomite-treated lease crudes.

© 1958, Continental Oil Company



For greater profits
. . . fracture with

ADOMITE®



Valves from W-K-M are noted for efficiency, low maintenance costs, easy operation

W-K-M Through-Conduit Gate Valves are famous for the safe, positive control of high pressures. They are preferred for conventional or multiple completion trees, flow lines, or wherever working pressures range from 500 to 15,000 pounds.

acf Lubricated Plug Valves—of steel, semi-steel and special metals—with round or rectangular ports—are specified for working pressures between 200 and 500 pounds on gathering lines, manifolds, headers, and similar low-pressure installations.

Valves from W-K-M are designed, built and serviced by men who know the oil fields.

On Hand

Order both W-K-M Gate Valves and ACF Lubricated Plug Valves from your supply store . . . W-K-M field service men are everywhere there's oil!

W-K-M

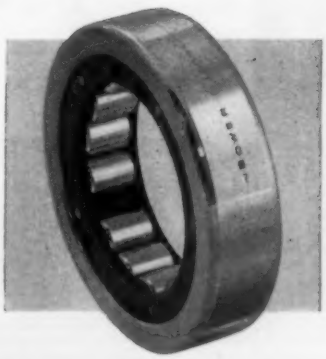
DIVISION OF **acf** INDUSTRIES INCORPORATED

P. O. Box 2117, Houston, Texas

W-K-M's *Creative Engineering* can assist you with any special problem. If it involves flow of fluids or gases through valves, check first with W-K-M. 5801

"ROUGHNECKS" IN ACTION . . .

And this phrase describes the *equipment*, as well as the men who handle such back-breaking work! Bearings, for instance, have to operate efficiently under tremendous loads around the clock . . . day in, day out. Bower cylindrical roller bearings are engineered for jobs like this—incorporating such advanced design features as integral thrust shoulders and raceway, and improved internal construction. Painstaking quality control makes them last longer, require little or no maintenance. If you use bearings, either in original equipment or for replacement purposes, specify Bower!



BOWER ROLLER BEARING DIVISION
FEDERAL-MOGUL-BOWER BEARINGS, INC. • DETROIT 14, MICHIGAN

BOWER

TAPERED • CYLINDRICAL • JOURNAL
ROLLER BEARINGS

POWELL

world's largest family of valves*

Fig. 1793 — Large Iron Body Bronze Mounted Gate Valve for 125 W. S. P. Outside screw rising stem and yoke, solid wedge disc. 8" and larger valves can be supplied with split wedge disc. Also available in all iron.

Fig. 559 — Large High Test Iron Body Bronze Mounted Swing Check Valve for 125 W. S. P. Heavily bolted iron cap. Renewable bronze seat rings, discs or disc facing, disc hinges. Can be used in horizontal or vertical position. All iron valves also available.

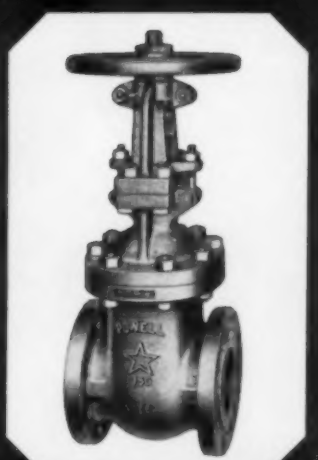


Fig. 1503 — Steel Gate Valve for 150 pounds. Outside screw rising stem. Heavily bolted bonnet and yoke. Precision fitted, accurately guided solid wedge disc. Valves with welding ends can also be supplied.

Fig. 1460 — "Master Pilot" Gate Valve for 150 W. S. P. Iron body bronze mounted. Bolted flanged bonnet with inside screw rising stem, solid wedge disc. Can also be furnished with flanged ends, and in all iron.

Fig. 8150 — Bronze L. P. Gas Globe Valve for 400 W. O. G. Union bonnet, inside screw rising stem, special composition disc, integral seat. Listed by Underwriters' Laboratories, Inc. Angle, Gate, Lift Check and Steel Valves available.

Fig. 1559 — Steel Lubricated Plug Valve for 200 pounds W. O. G.—A. S. A. 150 pounds. Screwed gland type. Single gland and bolted gland types can also be furnished. Large Valves—6" and above, can be supplied with gears for gear operation.

*and in this family there's a valve for every flow control requirement—for handling water, oil, gas, air, steam and corrosive fluids—available in the most required sizes and types. If your local distributor can't supply you, or if you need specially engineered valves for unusual conditions, write

THE WM. POWELL COMPANY • *Dependable Valves Since 1846* • **Cincinnati 22, Ohio**

SIKORSKYS ARE THE ONLY LARGE HELICOPTERS FULLY PROVED IN COMMERCIAL SERVICE

STEEL TOWER CONSTRUCTION

A 3,500-pound section of a steel high-voltage transmission tower is carried by S-58 to its inaccessible mountain site north of Los Angeles. In this project, the S-58 flew in crews to prepare 12 tower sites, poured concrete footings from hoppers hung beneath the aircraft, then flew the prefabricated tower sections into position. Many days of construction time were saved.

The only large helicopters thoroughly proved in commercial service are those made by Sikorsky Aircraft.

Only Sikorsky S-58s and S-55s have carried hundreds of thousands of passengers . . . and ton after ton of materials and cargo . . . in private-enterprise operations such as those of oil companies and scheduled airlines.

Sikorskys have also proved their versatility by handling a variety of jobs such as moving heavy steel towers, and lifting machinery, power line poles, and pre-mixed concrete to hard-to-reach places for public utility and construction companies.

Offshore, in the jungle or the Arctic, or wherever other transportation is inadequate, Sikorsky helicopters offer a unique capability to go wherever you need to go, carrying worthwhile payloads. And only Sikorskys have had successful heavy-payload commercial experience to back up their performance specifications. Write for complete information.

SIKORSKY AIRCRAFT
STRATFORD, CONNECTICUT
One of the Divisions of United Aircraft Corporation

NEW GUINEA AIRLIFT

Three S-58s are speeding the search for oil in the jungles of New Guinea. Sectionalized oil drilling rigs and all incidental equipment such as the steel mats above were carried to their sites by helicopter, eliminating expensive road building.

Photo; *The British Petroleum Co. Ltd.*

Welex YELLOW Has Gone to Sea

In the area which had been set aside for sea gulls and ships and sharks, the tremendous offshore drilling platforms have become a recognized partner. Now, the Welex offshore units have added their yellow brilliance to this picture. Here, oil men have tapped resources that are thousands of feet underneath a land that is covered by hundreds of feet of water. To aid these sea-going oil men, Welex offshore units offer the same top flight services that have earned the confidence of operators and producers on land for many years. From these bright yellow offshore units, perforating, resistivity and radioactivity logging and other special wireline services of unexcelled quality are all in a day's work. Only with Welex on the job can operators be assured of having available *every* needed logging and perforating service. On land or offshore, Welex offers the most complete industry-accepted wireline services whenever and wherever they are needed.

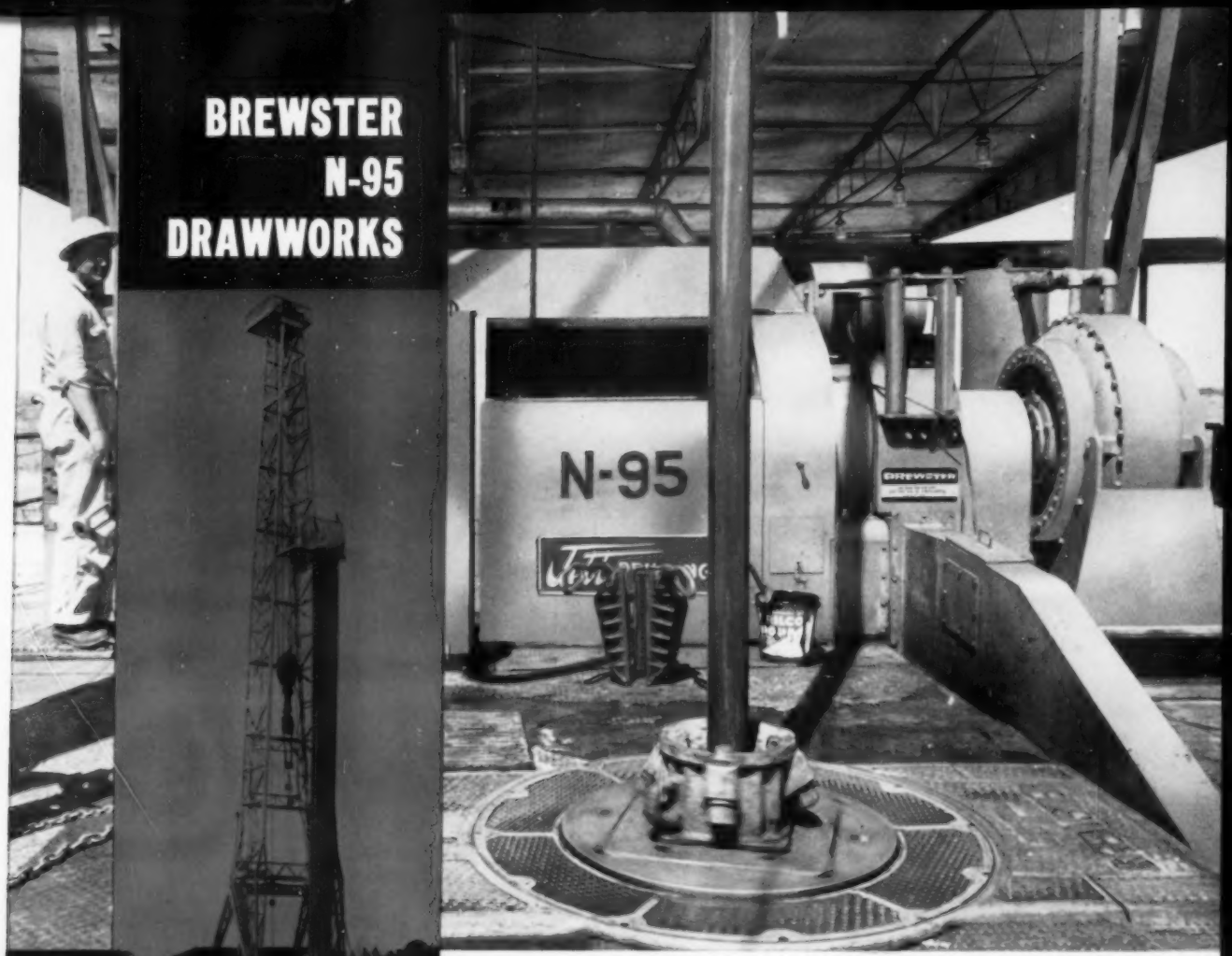
ORIGINATORS OF Welex JET PERFORATING

WELEX, INC.

Fort Worth, Texas

Division offices in Dallas, Denver, Houston, Los Angeles, Midland, New Orleans, Tulsa and Wichita • Subsidiaries in Canada, Peru and Venezuela

BREWSTER N-95 DRAWWORKS



JETT DRILLING COMPANY, INC. Rig 110 with a Brewster N-95 drawworks is now on its third 14,000-foot well.

You hear Brewster customers everywhere use this phrase when they describe the Brewster N-95 drawworks. From pump drives to drum it has been designed to take it on the chin and come up ready for even tougher going. Rated for 12,000-foot plus drilling, the N-95 has the reserve power to go on down profitably.

Flexible in design, the N-95 moves, operates economically and can be used on wells usually drilled by much smaller equipment. The drawworks is side skidded and can be separated from the compound by disconnecting one chain. The controls, auxiliary brake and drawworks move as a single unit without any disassembly.

Brewster Drawworks are built to do the job for which they are sold . . . they're not little rigs "built-up" or big rigs "cut down."

Check these exclusive features that you get ONLY when you buy a Brewster N-95 — (See next page)

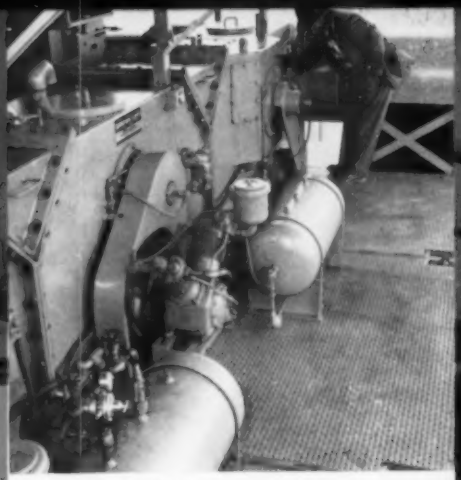
RUGGED IRON

Two-Fisted Tough

EASY DOES IT . . . when it's a Brewster control panel. Full air operation plus simplicity in design leaves the driller free to follow the crew as they make a connection.

BREWSTER

GOOD HOUSEKEEPING and good rig layout go hand in hand to make fast, safe and efficient operation on Jett Rigs.



HEAVY DUTY COMPOUND on the N-95 prevents wear on chain, bearings and engine couplings through positive alignment and rigidity.

SIMPLIFIED mud pump manifolding and clean layout are naturals with Brewster's dual in-line pump drive arrangement.

SCHEDULED MAINTENANCE means dependable operation. The crew here is subricating linkage on the big 46" hydromatic N-95 brakes.

JETT DRILLING COMPANY, INC.

RIG 110

One of 7 Brewster drawworks operated by Jett Drilling Company, Inc., of Shreveport, the N-95 on Rig 110 is now completing its 3rd 14,000-foot well. In all the Company is operating 12 rigs; three are leased and all others are Jett owned.

Jett Drilling's remarkable growth is firmly based on sound operating policy, good men and the finest available equipment. This is why the last two rigs purchased have been Brewster N-95's and why the rotary tables, swivels and blocks are all Brewster matched equipment.

BREWSTER N-95

THE BREWSTER COMPANY, INC.
Shreveport, Louisiana

NON-SKID, flat surface of the Brewster 27-inch oil-bath table provides safe footing for the crew.

TOOLPUSHER, E. M. RODGERS takes over controls for a "first hand" check out on rig performance.

SUPPLY HOUSES

Howard Supply Company • Apex Equipment Company • Bovaird Supply Company • Industrial Supply Company • Murray Brooks, Inc. • United Supply and Manufacturing Company • Export Sales: The Brewster Company • (HOMCO) Houston Oil Field Material Company, New York, N. Y., Houston, Texas; Mexico City, D. F.

1200 horsepower is available to the driller from these three LRZBU engines.

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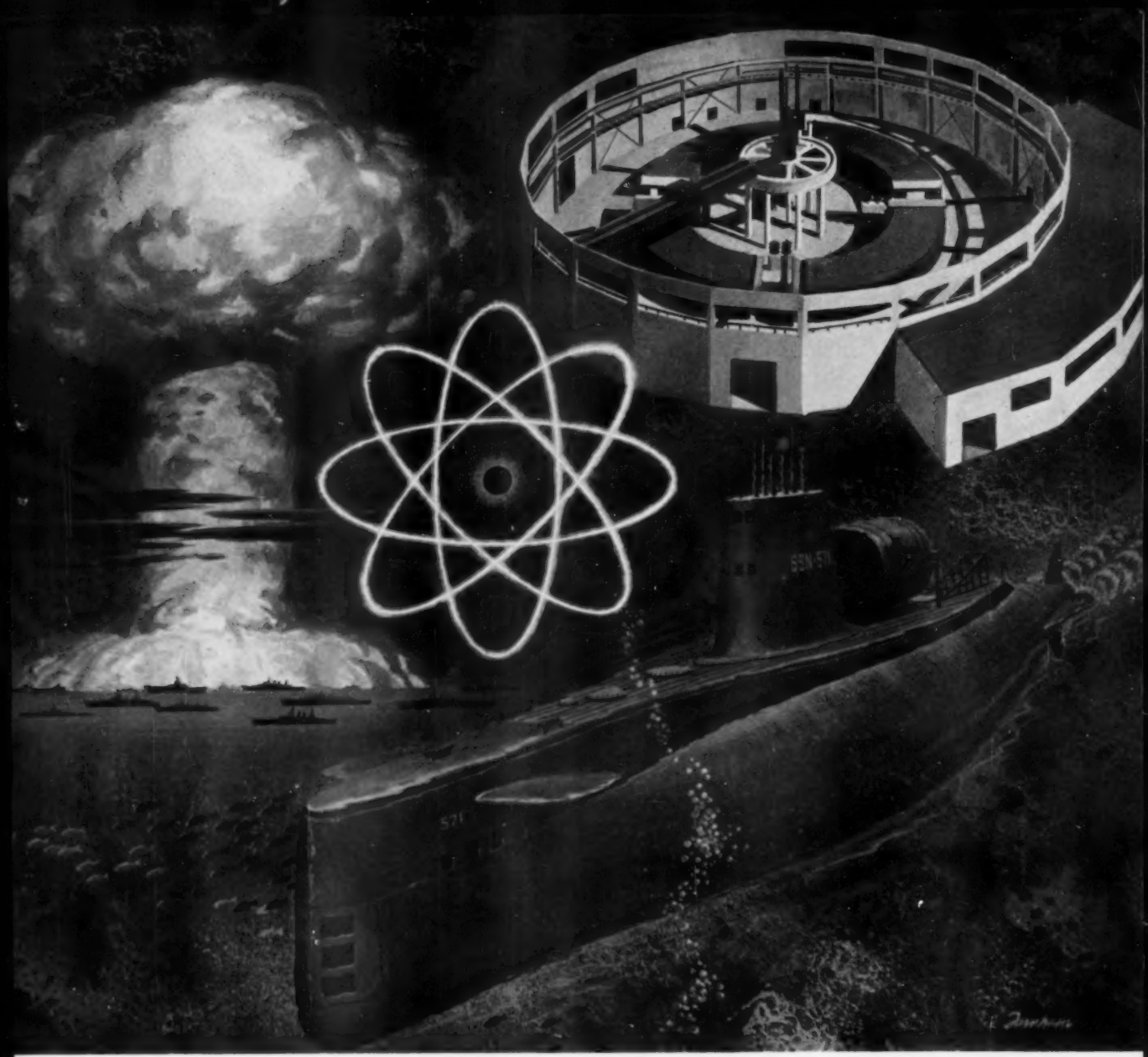
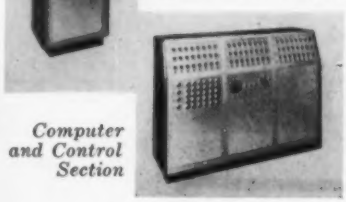


Small but significant. The minute atom abruptly revolutionized scientific theories with its significance. General's automatic plotter and computer—the *Geopac*—has also revised modern thinking. This *compact unit* presents an entirely *new concept* in seismic interpretation. Offering speed and accuracy, the *Geopac* frees the seismologist from numerous routine details. *Geopac*—the efficient, economical method of processing and presenting seismic data.

Plotter Console

Magnetic Play Back Drum and Amplifier



Computer and Control Section

General GEOPHYSICAL COMPANY

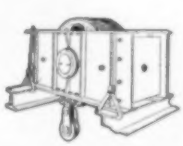
In Canada: 10509 81st Avenue, Edmonton, Alberta, Canada

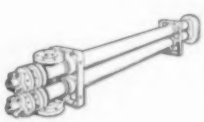
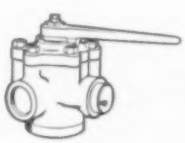
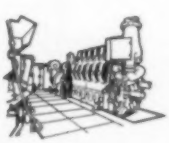
General Geophysical Company de France (Sarl), 4 Square Rapp • Paris 7, France
General Geophysical Company de Venezuela, C. A., Sociedad A. Camejo No. 16 • Caracas, Venezuela

WHEN YOUR CONTRACT IS WITH GENERAL, THE PERCENTAGE FOR SUCCESSFUL EXPLORATION IS IN YOUR FAVOR

An ALCO Type RWA automatic casing hanger is installed in a deep well in South Louisiana.

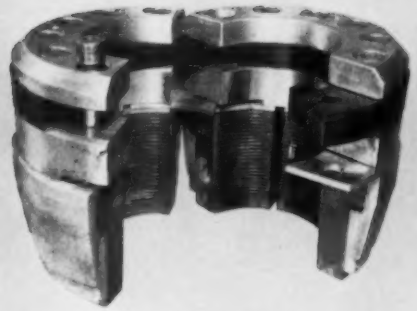
ALCO PUTS THE RIGHT COMBINATION



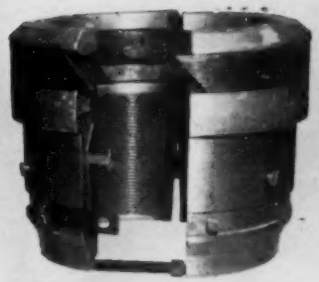




Crown and travelling blocks • *Oil-field valves* • *Finned tube products* • *Kinney plug injectors* • *Diesel-electric power package*

The Type C-8 automatic hanger, near right, of tapered-bore design is pressure-sealed by casing weight. "Controlled friction" slips hold casing gently, prevent excessive reduction of casing diameter. The Type RWA, far right, has a unique automatic sealing principle, straight bore body design.

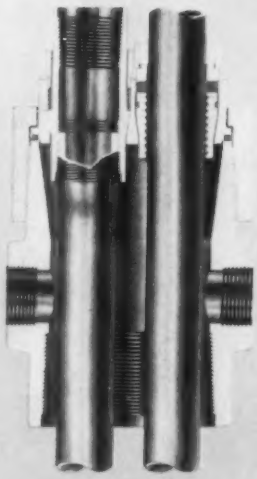


Type C-8

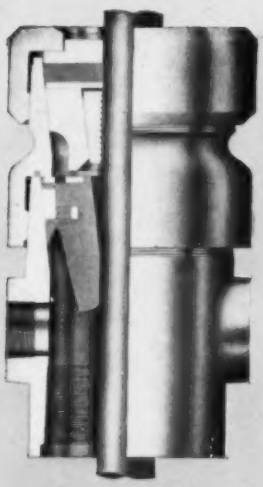


Type RWA

The PX-350 tubing head, far right, has long been an efficient and economical method of suspending tubing on a shallow completion and, later on, for working over the well or putting it on pump. The new ALCO dual completion head, near right, now permits even greater flexibility with the basic PX-350.



Type PX-350 Dual



Type PX-350

FOR YOUR WELL ON YOUR WELL

ALCO well-head equipment is designed and built to meet your problems in the field. No matter what the depth or pressure of your well, ALCO hangers and heads for tubing and casing combine to suit your well's conditions.

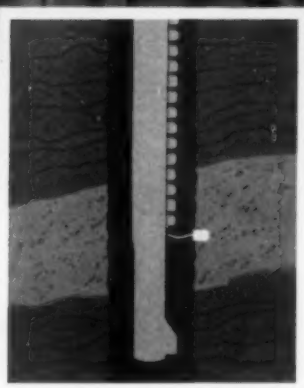
For example, on deep high-pressure wells ALCO now offers two new, improved casing hangers. Flexibility of design in the straight-bore Type RWA hanger makes it effective and economical for either medium or deep wells, reducing your inventory. The tapered-bore Type C-8 hanger is interchangeable with other Type C hangers for Type C, CS and CR heads. Both of these new casing hangers can be lowered through blowout preventers. Each of them seals automatically. The grab on the casing is controlled and cannot exceed the amount necessary to suspend the casing.

For lower-pressure wells ALCO's Type PX-350 tubing head has the flexibility that allows you to change production plans when the well comes in. It is also available in a dual-production model. ALCO makes non-lubricated gate valves, tees, crosses, fittings and flow-control equipment to complete the ALCO well-head assembly—tested in the shop and proved for years in major oil fields.

For specifications on ALCO equipment consult the Composite Catalog, or contact ALCO Products, Inc., Dept. 184, Bank of the Southwest Building, Houston 2, Texas.

ALCO

ALCO PRODUCTS, INC.
Petroleum Industry Equipment Division
HOUSTON



FASTER
BETTER
SAFER

Elgen controlled-depth cores give a closer look at production possibilities.

Elgen's side wall core services are the finest in the field. 1 to 30 zone selections in one trip . . . cores large enough for accurate analysis. Gun loading simplicity eliminates bulky field equipment, adds to speed of operation. Automatic gauges assure knowledge of tool operation. Exclusive circuit design and maximum safety devices are featured.

Remember — you'll get **FASTER, BETTER, SAFER** coring results with Elgen . . . and at less cost.

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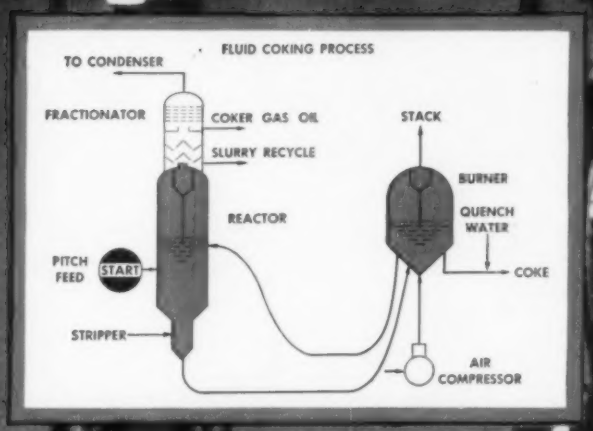

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Esso Research and Engineering Company offers you *Fluid Coking*, the first successful fully continuous process for converting low value pitch into valuable lighter products. *Fluid Coking* actually handles the heaviest feed that can be pumped.

It results in a higher percentage of gas oils, and makes possible greater ultimate yields of good quality heating oil and gasoline, and smaller amounts of coke than any coking process ever developed. *Fluid Coking* is another achievement of the Esso Research program — 39 years of new process developments made available to refiners around the world.

Investment and operating costs are lower. "Fluidized coke" by-product is used as public utility fuel and in the smelting industry; other new and more valuable outlets have been developed.

Seven *Fluid Coking* installations are on stream. Licensees enjoy benefits of continuing *Fluid Coking* research. Flexible *Fluid Coking* can play an important part in helping you process heretofore uneconomical crudes and maintain your refinery balance. We would welcome your inquiry.

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Your key to progress... an Esso Research process

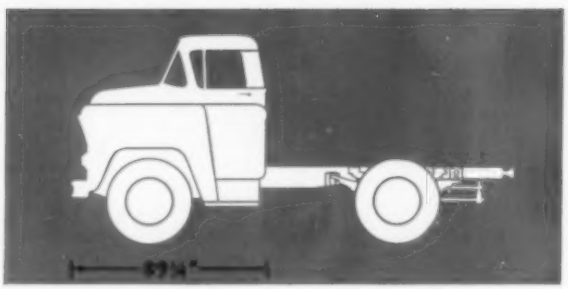
Chevrolet's new heavyweights

Unique design advantages . . . special work-whipping CHEVROLET heavyweights the trucks best able

NEW L.C.F.'s DESIGNED FOR LONGER LOADS AND LONGER LIFE

Notice how *compact* Chevrolet's Low Cab Forward tractors are—only 89¼ inches long from bumper to back of cab! That means you can pull a huge 35-foot trailer, yet keep the overall length of the truck under 45 feet. *It's a special design advantage you get with Chevrolet,* and so is the good weight distribution of the L.C.F., which places more truck weight and load weight on the front axle to let you haul heavier loads. Likewise, the L.C.F. short wheelbase that makes maneuvering a breeze . . . or the easy-to-get-at L.C.F. engine compartment that takes much of the work out of servicing.

Chevrolet makes a wide variety of heavyweight L.C.F. models. Most likely, one of them is made to order for *your* job! Series 50H L.C.F.'s go up to 21,000 lbs. G.V.W., Series 70 models to 22,000 lbs. G.V.W., and Series 90 models to 25,000 lbs. G.V.W. They're all built for extra years of hard use, with the huskiest of heavyweight components, such as those discussed at the right.



CHEVROLET

CHEVROLET

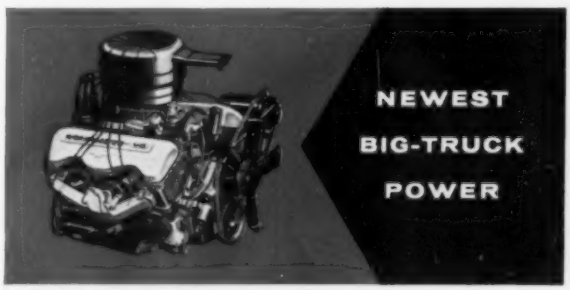
are built to beat big jobs!

features . . . these are the things that make to do big jobs the way you want them done!

NEW CONVENTIONAL MODELS WITH MORE "MUSCLE"

The rougher the job, the better these big Chevies seem to like it! Chevrolet conventional models, as well as the L.C.F.'s, have what it takes (tough, big-truck components!) to make short work of the heaviest hauls. You can specify big Eaton single or 2-speed rear axles with up to 18,000 lbs. capacity . . . modern New Process, Spicer or Powermatic transmissions . . . Hydrovac, Air-Hydraulic, or Full-Air brakes . . . Cast Spoke wheels . . . and lots more. *Everything* is designed to take it!

And that includes power! Standard in Series 90 and 100 models is the newest of big-truck powerplants, the revolutionary Workmaster V8. With 230 h.p., 335 ft.-lbs. of torque and radical Wedge-Head design, it's ready to save you many extra hours and dollars on



rugged runs. And modern Taskmaster V8's give the same kind of performance in Series 50H, 60H, 70, and 80 models! Yes, there's something for *you* at your Chevrolet dealer's . . . a new Chevy heavyweight that's *built* to beat your big jobs! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

TASK·FORCE TRUCKS

It wasn't so deep . . . but it was tough . . . and the chips were down

Experience made the difference, just as it has so many times—on so many wells. *Experience* . . . the magic qualification that can be claimed by so few, in any industry. When it really counts . . . and *every potential producer* does count . . . experience can mean the difference in getting the facts.

Whether the hole is shallow or deep, the job is simple or tough, you get added benefits with Johnston . . . the most sensitive pressure recorder available built into testing equipment designed to withstand any down-hole condition . . . well trained, qualified testing personnel . . . unmatched service . . . evaluation that sets the industry standard. All this, plus experience gained from thirty years of drill stem testing and over one half million testing operations, is yours when you call Johnston. There is a difference in drill stem tests . . . and Johnston experience makes the difference.

When the stakes are high is no time to call in the second best drill stem testing company . . . no time to shop for a cheap test.

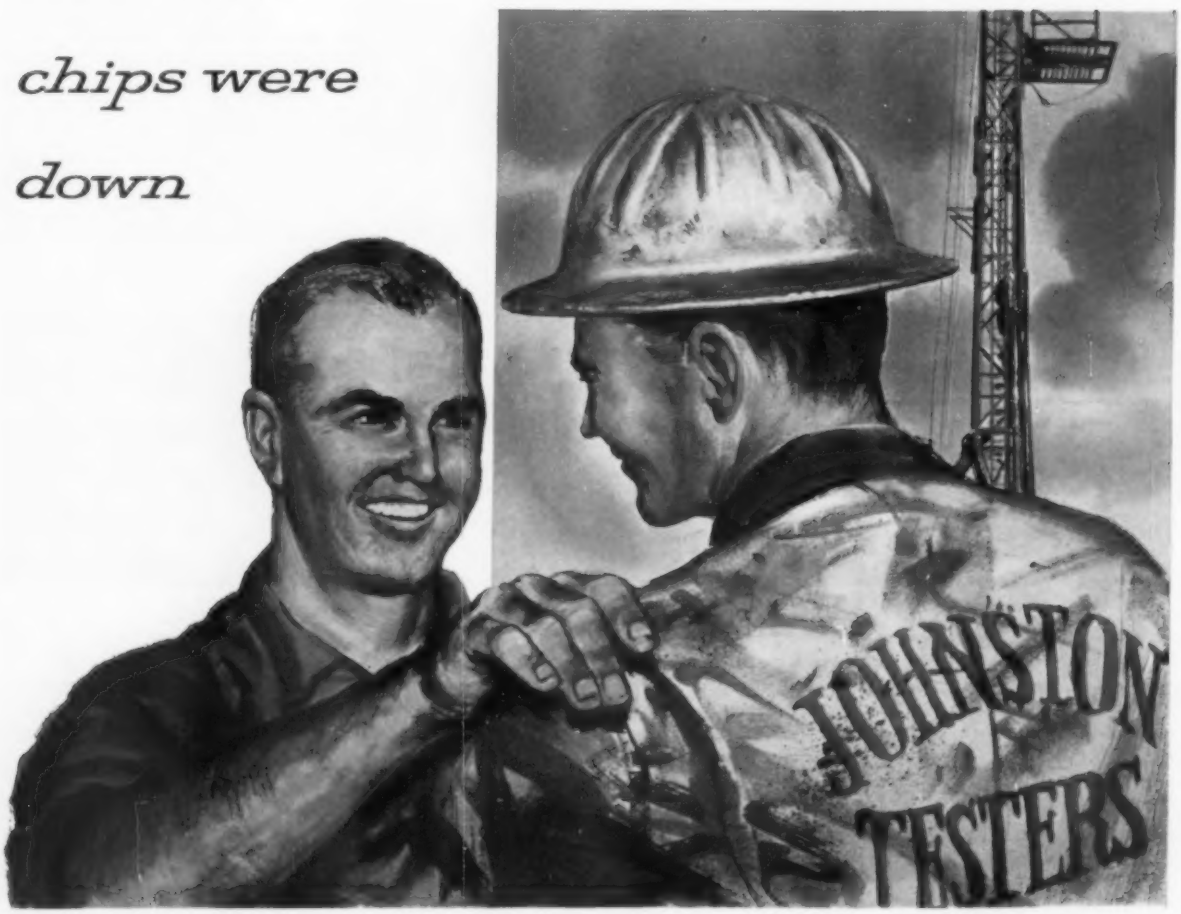
If you can justify a drill stem test, you can justify the best. Give your well every chance to be a producer. You can, just by calling Johnston Testers.

Always call Johnston and be sure.

Johnston Testers, Inc., Houston, Texas; Long Beach, California; Calgary, Alberta, Canada. Export sales office, Houston, Texas.

A WORLD OF EXPERIENCE

JOHNSTON TESTERS

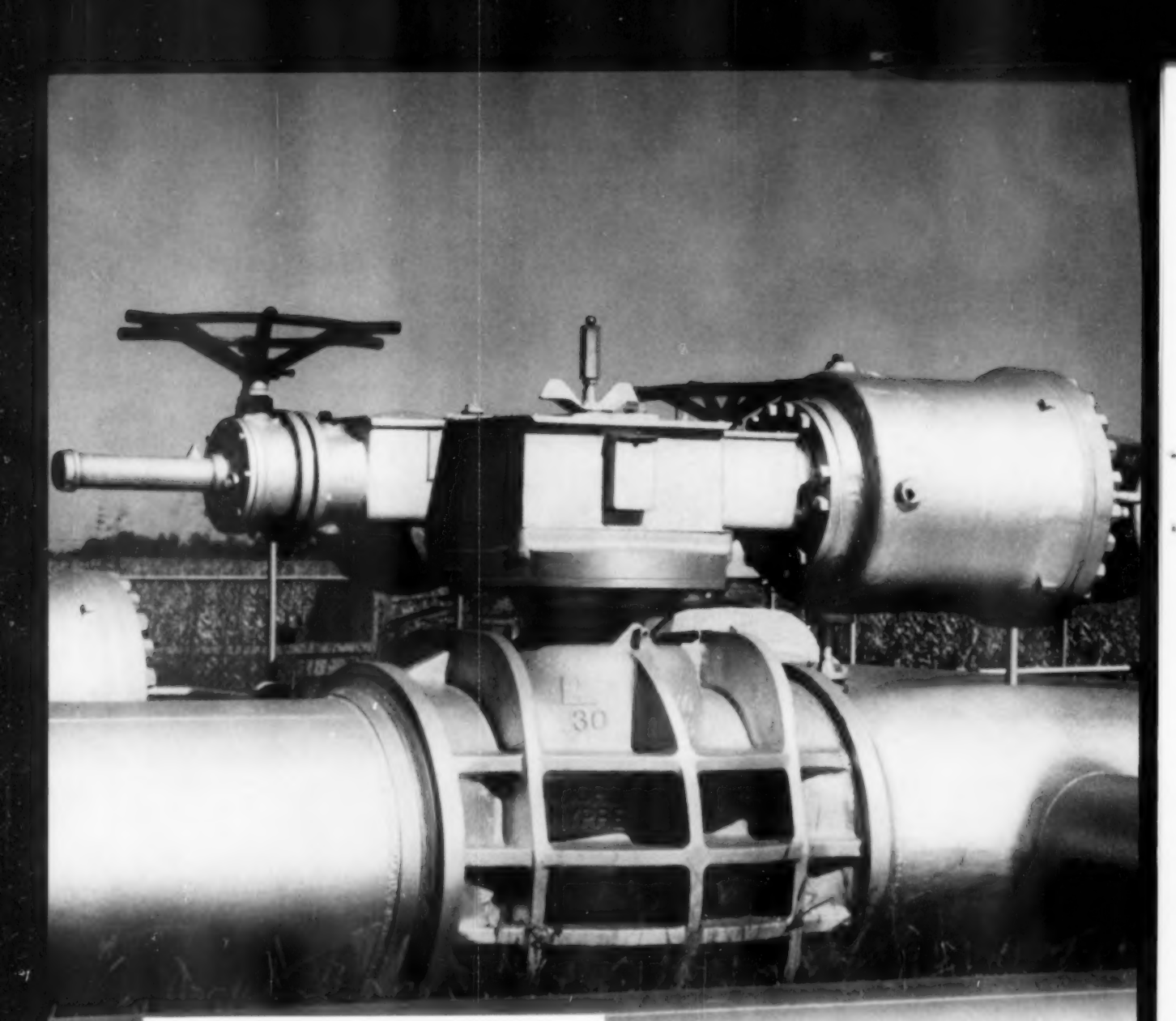


EMERGENCY VALVES never have a second chance . . . that's why so many of them are Rockwell-Nordstrom lubricated plug valves. The absolute dependability and positive shut-off that make these valves unequaled for the dramatic services are the same reasons why they will do a better job, longer and at lower cost, on routine services. Rockwell-Nordstrom is the world's most complete line of lubricated plug valves and plug valve accessories. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

ROCKWELL-Nordstrom VALVES

it's **ROCKWELL**

MANUFACTURING COMPANY



HOW FAST WILL IT CLOSE?

Rockwell-Nordstrom valves close much faster than ordinary valves . . . the *lubricated* plug moves only through 90° for *full*, positive shut-off.

Rockwell-Nordstrom is the world's most complete line of lubricated plug valves and plug valve accessories. Rockwell Manufacturing Co., Pittsburgh 8, Pa.

ROCKWELL-Nordstrom VALVES

it's **ROCKWELL**

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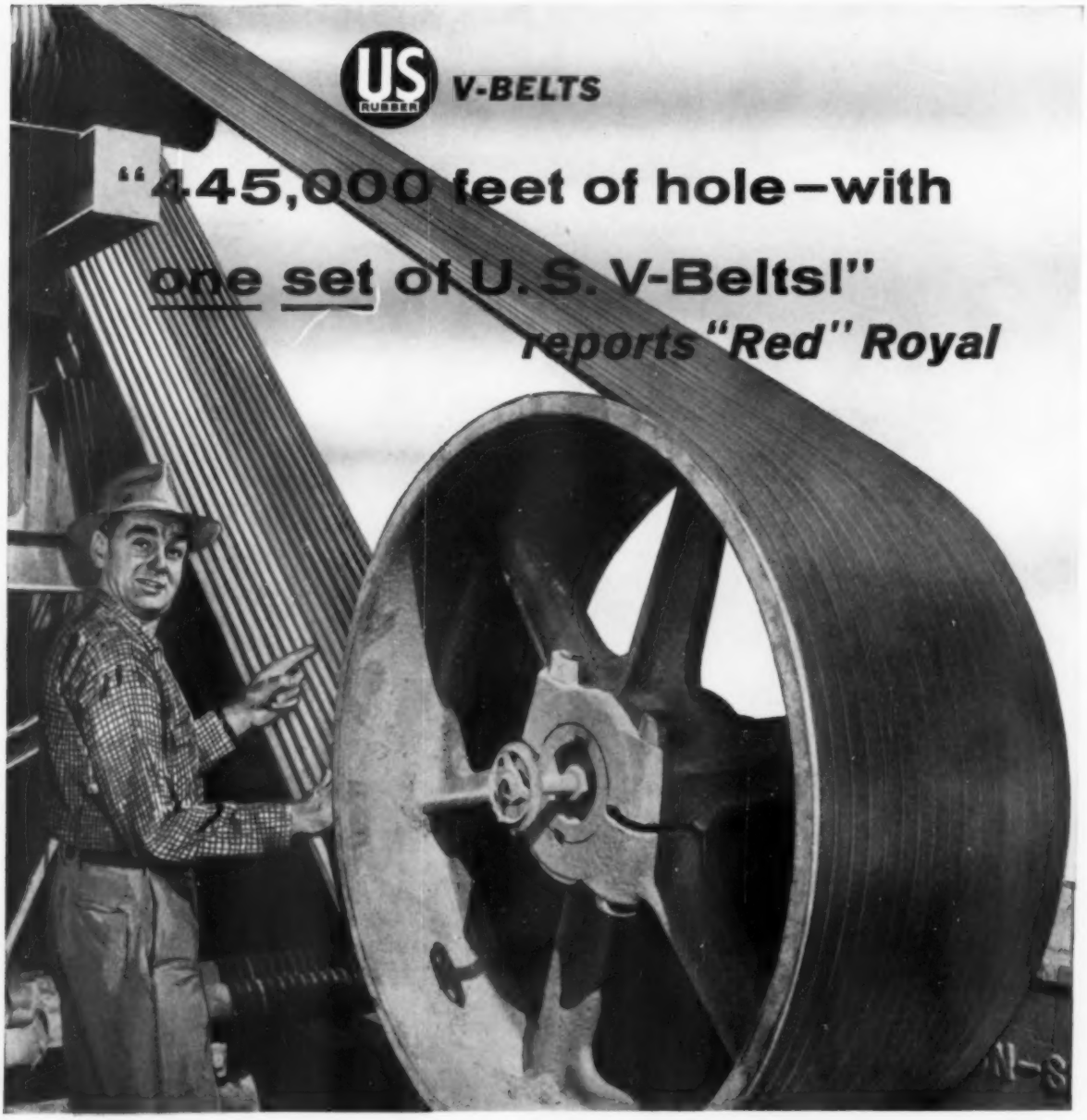
5802

CF&I SEAMLESS casing and tubing AP

THE COLORADO FUEL AND IRON CORPORATION · DENVER, COLORADO



Talk about getting V-Belt drilling mileage! That's what "Red" Royal's friends – toolpusher Mac Cavasar and his crew – got on their Holmes Drilling Co. rig.

Back in 1951, not satisfied with the brand of belts being used, Mac's company switched to a set of U. S. V-Belts. For the next 5 years, these belts were in almost continuous operation, exposed to all the rigors of Texas climate, constantly being moved from one drilling site to another. And in that time, this one set of belts drilled almost 85 miles of hole – without any special maintenance whatsoever.

Naturally, Mac and drilling superintendent O. R. McLamore are very satisfied with the performance of U. S. V-Belts. They're using them extensively on pumps and several smaller drives, many of which are well on their way to equally impressive records.

"In addition to the quality of the belts," says McLamore, "we also rely on the 'U. S.' sales representative for technical assistance on the drives."

It's this 2-way assurance – product quality and engineering aid – that makes your best buy U. S. Rubber V-Belts.

Available in all fields at supply stores.

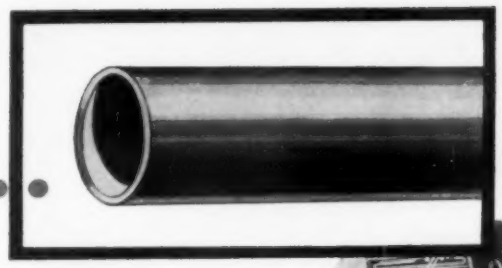
US RUBBER

Mechanical Goods Division

United States Rubber

See things you never saw before. Visit U. S. Rubber's new Exhibit Hall, Rockefeller Center, N. Y.

Casing...



Clutches...

Complete Supply

from Mid-Continent where and when you need them....

Complete in-the-field stocks of parts and equipment at your Mid-Continent field store are planned in advance to anticipate the specific supply requirements of your area.

For around-the-clock supply service from thousands of items carried in stock, call your local Mid-Continent representative.

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THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

Now Cutler-Hammer Three-Star Oil Well Pumping Control available in 5 sizes...up to 100 HP

It's here . . . Cutler-Hammer Three-Star Oil Well Pumping Control for pumping wells requiring larger horsepower motors. These new starters feature the famous rugged construction, dependable performance, and automatic operation which has made Cutler-Hammer Control first choice among oil field men everywhere.

Cutler-Hammer Three-Star Oil Well Pumping Control with vertical dust-safe contacts can be relied upon to pump your wells *indefinitely* without attention as far as the electrical equipment is concerned. The exclusive Supertimer automatically starts, stops, and cycles the pumping operation according to the exact program you select. Advanced-design lightning arresters protect the control from lightning damage, and the three-coil overload relay protects the pump motor from overloading and dangerous single phasing which often results from lightning.

For your next pumping well, choose Cutler-Hammer Three-Star Oil Well Pumping Control. Your nearby Authorized Cutler-Hammer Distributor is stocked and ready to serve your needs. CUTLER-HAMMER Inc., 1453 St. Paul Ave., Milwaukee 1, Wisconsin.

First in performance...
first in dependability
Cutler-Hammer Three-Star
Oil Well Pumping Control

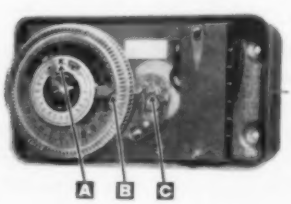
Control Size	MOTOR HORSEPOWER 110V	208/220V	380, 440, 550V
Size 0		3 Hp	5 Hp
Size 1	3 Hp	7 1/2 Hp	10 Hp
Size 2	7 1/2 Hp	15 Hp	25 Hp
Size 3	15 Hp	30 Hp	50 Hp
Size 4		50 Hp	100 Hp

CUTLER-HAMMER
CONTROL
C-H

Member American Petroleum Institute

CUTLER-HAMMER SUPERTIMER

This is automation in action. You preset the Supertimer to meet your field allowable and the control will do the rest, automatically. It starts, stops, restarts and cycles indefinitely, precisely according to your schedule. If a power outage occurs, any number of C-H controlled pumps are automatically restarted in an exact sequence to avoid overloading the power lines on inrush. Unfortunate coincidental starting of even two pumps is impossible.



A. Sets the precise restarting time delay from zero to 180 seconds. This is exclusive with the Supertimer—unfortunate coincidental starts of even two pumps are impossible.

B. Sets the daily pumping schedule—pull a tab for each fifteen minutes of pumping, space them through the daily 24 hour period as desired.

C. Sets the weekly pumping schedule —1, 2, 3, 4, 5, 6 or 7 days per week as desired.

FIELD FACTS

Amazing "K" Monel sucker rods!

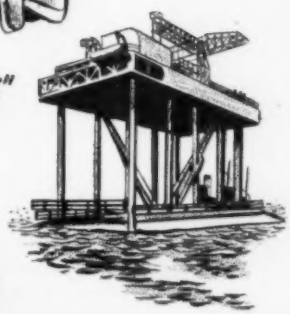
3/4-inch rods lift weight equivalent of 2 passenger cars 3 feet... 126 million times! Still going strong!

3/4-INCH DIAMETER SUCKER RODS MADE OF "K" MONEL* AGE-HARDENABLE NICKEL-COPPER ALLOY WERE INSTALLED IN SOUR WEST TEXAS WELL OVER TEN YEARS AGO. EXCEPT FOR BRIEF INTERRUPTION TO CHANGE WELL TUBING, THIS STRONG, CORROSION-RESISTING "K" MONEL STRING HAS BEEN WORKING EVER SINCE—LIFTING AND DROPPING ITS OWN WEIGHT PLUS THAT OF THE COLUMN OF OIL (8690 POUNDS) EVERY THREE SECONDS!

Barograph so sensitive it measures the pressure change of one step up.

HIGHLY SENSITIVE INSTRUMENT—USED FOR CORRECTING GEOLOGISTS' ALTIMETERS—CHARTS AIR PRESSURE VARIATIONS AS SMALL AS 0.0003 PSI...THE EQUIVALENT OF AN 8-INCH STEP UP A FLIGHT OF STAIRS. HEART OF THE BAROGRAPH IS A MONEL NICKEL-COPPER ALLOY ACTUATOR. MONEL ALLOY WAS PICKED BECAUSE IT RESISTS CORROSION EVEN IN DAMP, SWAMPY COUNTRY, WHICH WOULD ALTER CRITICAL DIMENSIONS AND AFFECT ACCURACY.

65-foot "leggings" for giant's sea legs...



GIANT LEGS OF HUGE 10-STORY HIGH S-55 OFFSHORE DRILLING RIG—LARGEST SEAGOING RIG EVER LAUNCHED IN NEW ORLEANS—ARE PROTECTED IN CRITICAL SPLASH ZONE BY THIN 0.031-INCH MONEL* NICKEL-COPPER ALLOY SHEATHS. 65 FEET FROM TOP TO BOTTOM! MONEL SHEATHING HAS PROVEN ITSELF THE MOST PRACTICAL WAY TO CONTROL SPLASH CORROSION.

Do you have a metal problem?

PERHAPS AN INCO NICKEL ALLOY CAN LEAD YOU TO A QUICK SOLUTION. TO FIND OUT, WRITE FOR INCO'S "METALS TO MAKE PETROLEUM PRODUCTION EQUIPMENT PRODUCE MORE"!

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

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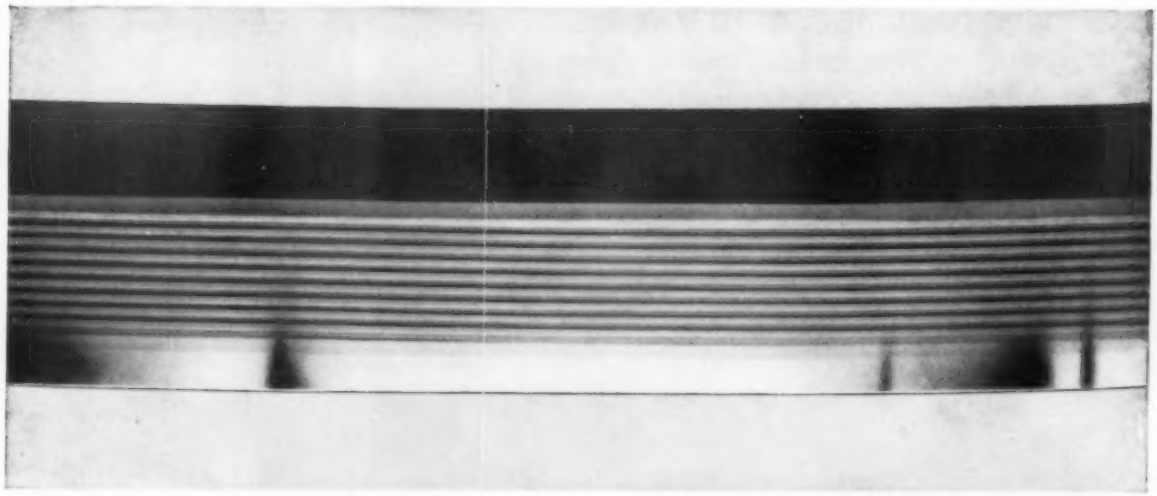
INCO NICKEL ALLOYS

Reduce break-in time by as much as 80%!

with factory pre-seated full chrome PEDRICK PISTON RINGS



Bright highlight along lower face of ring shows area pre-seated by factory lapping.

Use of PEDRICK Chrome Piston Rings reduces break-in time by as much as 80% . . . allows the engine to be put under full load very quickly. This is because PEDRICK laps or pre-seats its Chrome Rings to cylinder size *at the factory*. PEDRICK Chrome Rings are the most modern twist-seal and/or taper face designs, which further speeds seating and helps provide a quick, positive seal.

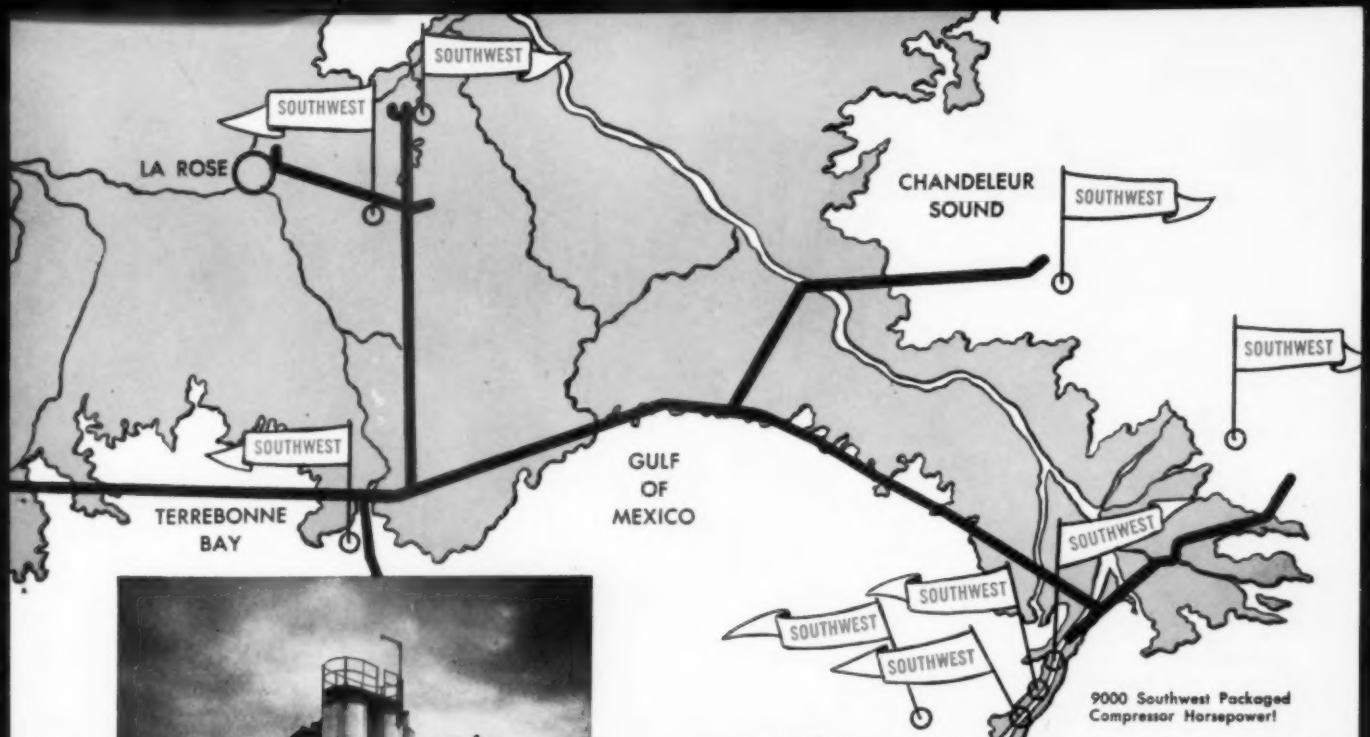
All PEDRICK Chrome Rings have a full Chrome coating. Chrome coating on a PEDRICK Ring is never less than .006 inches and may be as much as .010 or .012 inches thick depending upon the size of the ring and the use for which it is intended. On PEDRICK Chrome Rings, thickness of the Chrome coating is measured *after* the lapping operation.

PEDRICK Full Chrome Rings resist scuffing, withstand high temperatures, abrasion and corrosion.

Include PEDRICK top Chrome Rings in your replacement ring sets and increase ring life by as much as four times. A PEDRICK engineer will be glad to call and help you solve any special problems. Write, wire or phone: WILKENING MANUFACTURING CO., Philadelphia 42, Pa., SAratoga 9-3770.

Pedrick PISTON RINGS

PEDRICK PIONEERED CONFORMABLE PISTON RINGS FOR BIG-BORE ENGINES



9000 Southwest Packaged Compressor Horsepower!

Southwest

PACKAGED GAS COMPRESSORS FEEDING "THE MUSKRAT LINE"

From the South Pass area of the Mississippi Delta west for almost 400 miles to Crowley, La., the Muskrat Line lies in swamps, bays, and marshes. Eighty per cent of the line lies underwater! To boost the pressure of gathering lines feeding into it, five majors have turned to Southwest Packaged Gas Compressor Plants. These Southwest units can be installed in any location to do any compressing job. These balanced units can be mounted on piling, concrete platforms, barges, or wherever necessary for most economical installation and operation.

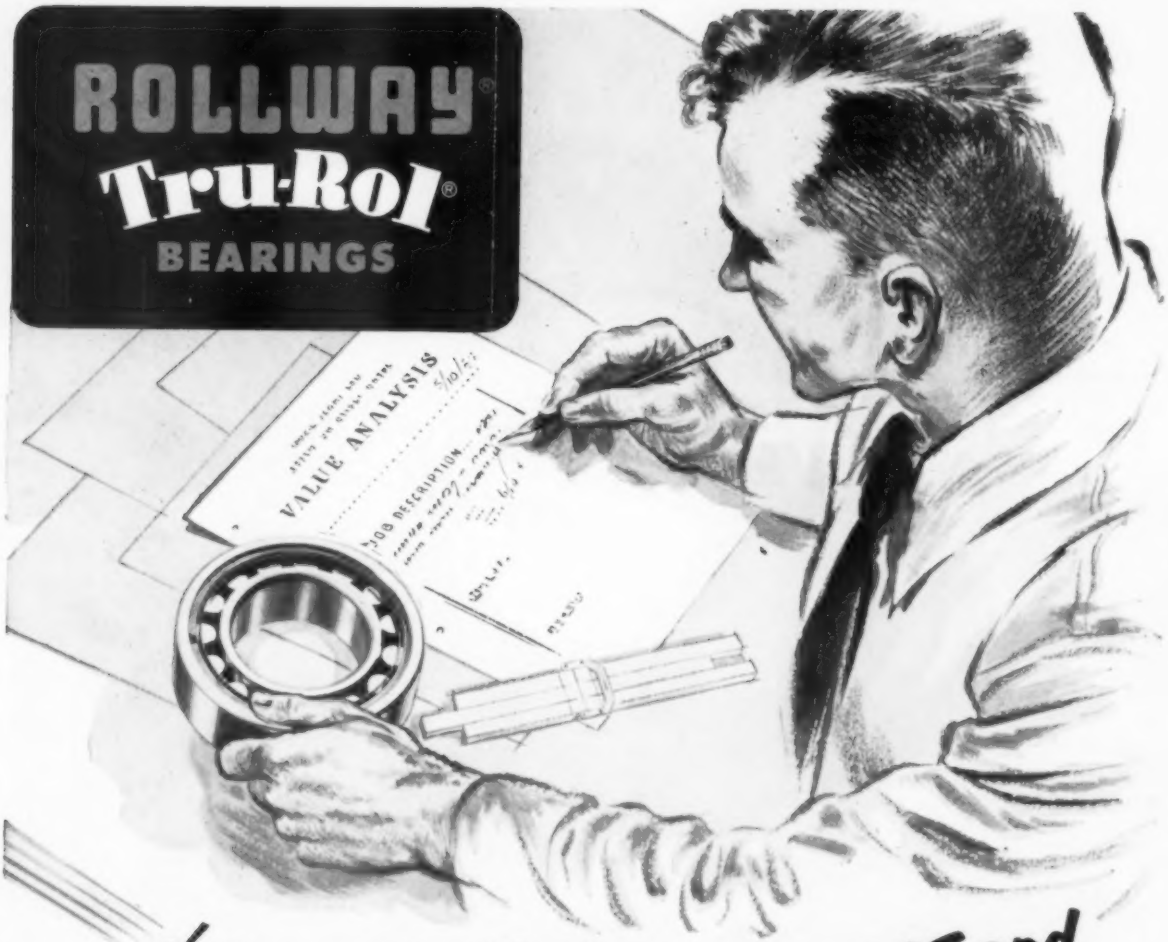
Southwest plants are saving gas producers thousands of dollars in the rugged swamp country of South Louisiana through low installation and low operating costs. Available in sizes from 265 hp to 660 hp.

FOR GAS LIFT, GAS BOOSTER, PRESSURE MAINTENANCE AND SIMILAR PROJECTS.

SOUTHWEST INDUSTRIES, INC.

P. O. Box 19392, Houston 24, Texas

ROLLWAY® Tru-Rol® BEARINGS



For a sound balance of LOW COST and HIGH PERFORMANCE

When you need maximum precision bearings, buy them. They'll save you money. Rollway has them in all types and sizes.

But in hundreds of applications, maximum precision means *unused* precision. The speed, load and life-expectancy demands are not critical. For these spots, Rollway's Tru-Rol Bearings are engineered to give all that is required in performance at worthwhile savings in cost.

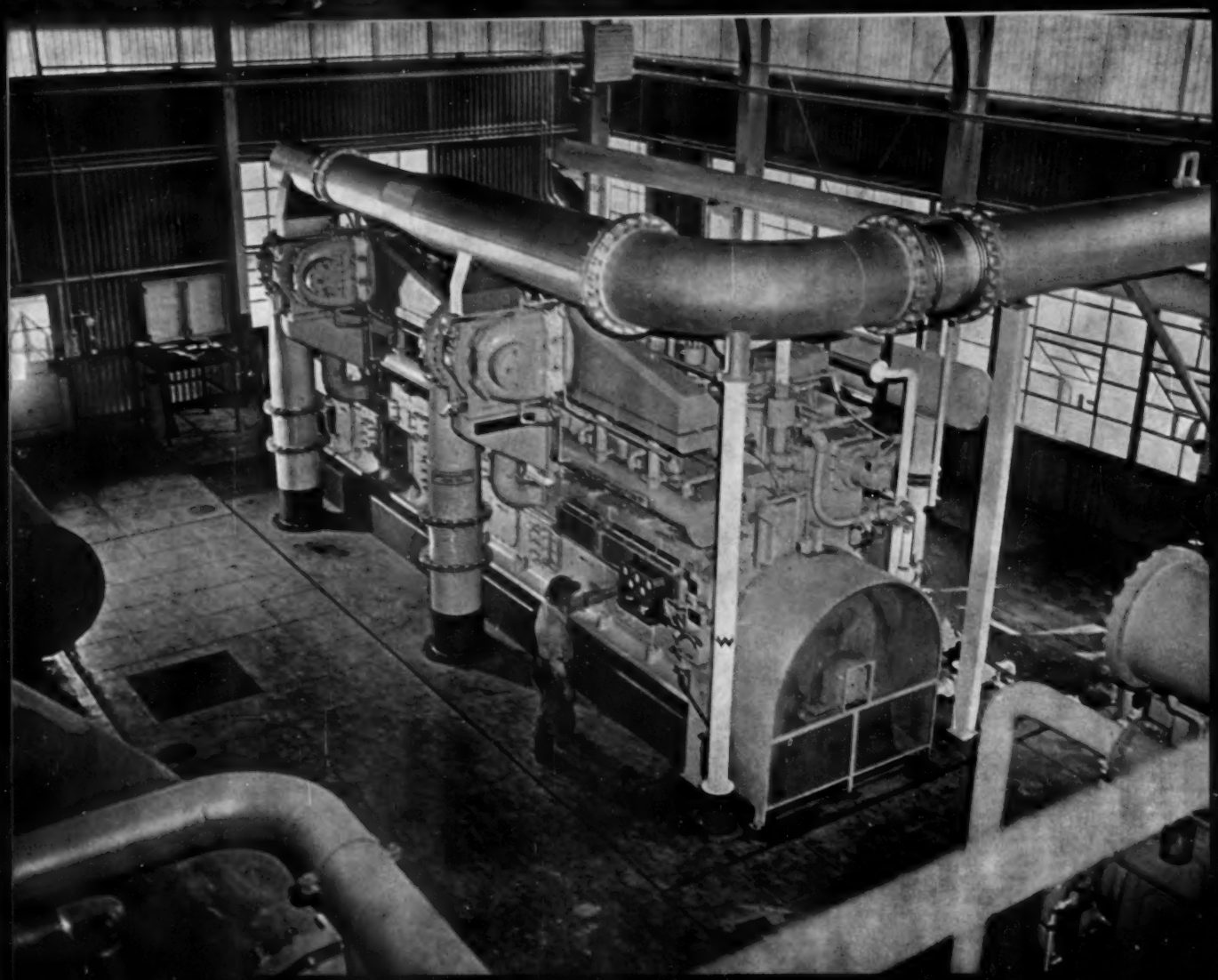
Maximum-Type Design and Construction Principles

The Tru-Rol segmented steel retainer is the strongest, most durable available in commercial-grade bearings. Its separator segments are formed to the curvature of the roller for true axial alignment. In combination with rollers crowned to provide equal load distribution, it withstands heavy shock and reversing loads over long periods.

For all the precision and performance you need and can use in non-critical applications, ask a nearby Rollway Service Engineer to brief you on Rollway Tru-Rol characteristics and versatility.

ROLLWAY BEARING COMPANY, INC.
SYRACUSE, NEW YORK

ENGINEERING OFFICES: Syracuse • Boston • Chicago
Detroit • Toronto • Pittsburgh • Cleveland
Milwaukee • Seattle • Houston • Philadelphia
Los Angeles • San Francisco



ANOTHER WORTHINGTON FIRST

SUTC

THE ONLY 2-CYCLE ENGINE COMPRESSOR WITH SELF-SUSTAINED TURBOCHARGING!

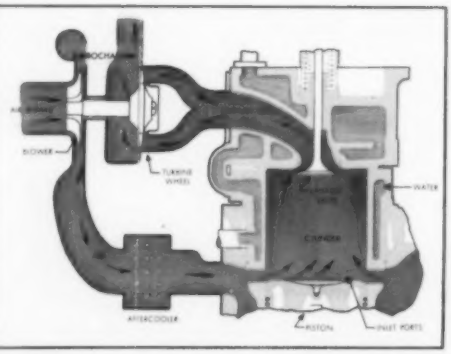
TURN PAGE FOR DETAILS

WORTHINGTON'S SUTC

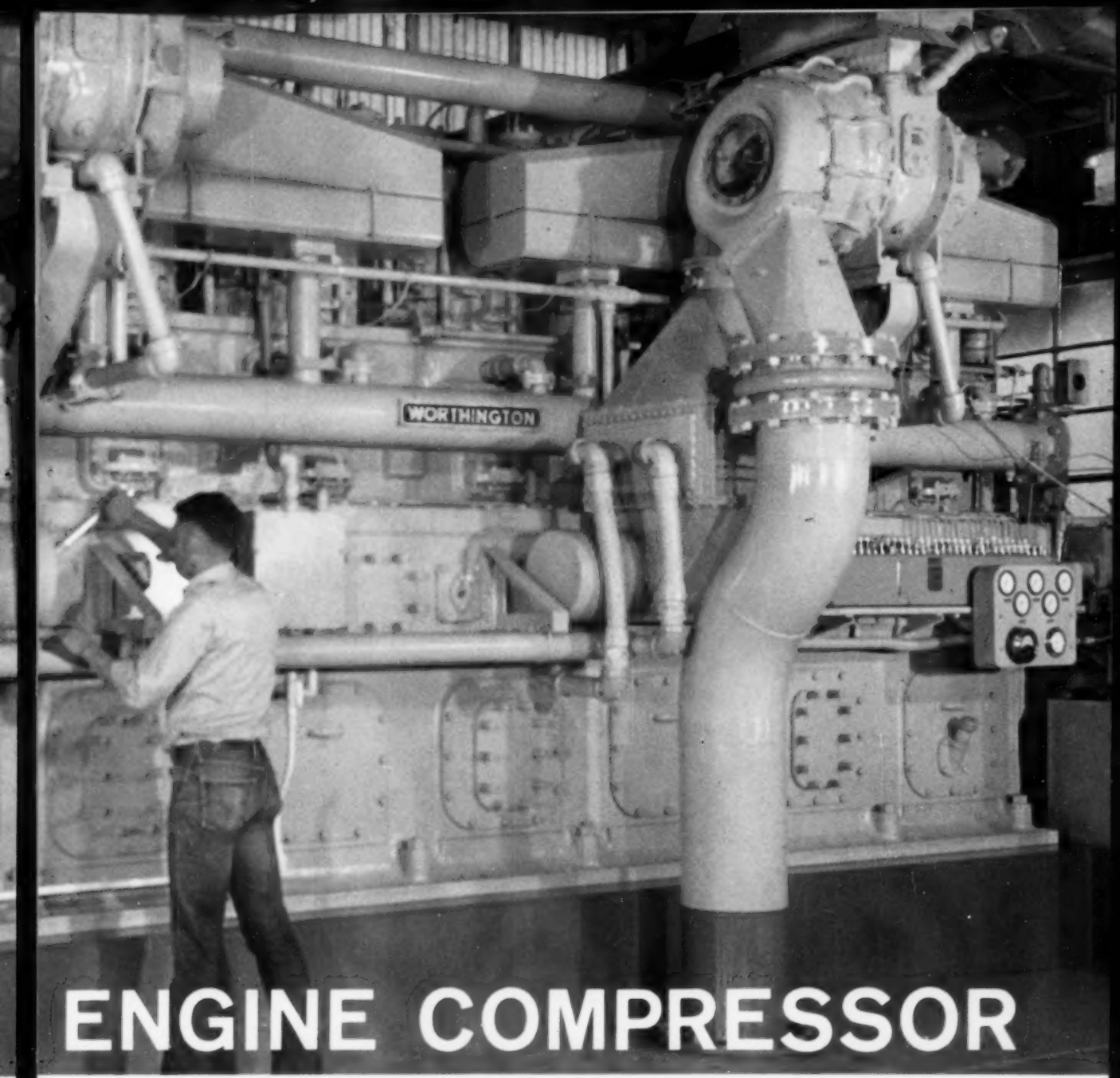
Easier starting, quicker loading, ...

TURBO-UNIFLO OPERATION

Straight through flow of air in the cylinder, the large inlet port areas (full 360 degrees), and the timed exhaust valves give maximum scavenging effectiveness with optimum back pressure.



Compact, reliable, efficient—the unique SUTC gas engine compressor with independent turbocharging has quickly become the outstanding engine compressor on the market. (Today, SUTC engines are in operation in chemical, petro-chemical plants and in pipeline service throughout the world!) Thanks to the self-sustained turbocharging feature the SUTC develops almost double the hp in the same space required by a non-turbocharged engine. Further, the field-proved Worthington TURBO-



ENGINE COMPRESSOR

most flexible in operation

UNIFLO system provides the most complete scavenging, resulting in a complete absence of residual gases in the combustion chamber.

Power — The SUTC integrates exhaust-powered turbocharging with field-proved Uniflo scavenging design for unequalled stability of performance over the complete range of speed and load requirements. The SUTC range: 1250 to 2500 hp. Supplied in 5, 6, 7, 8 and 10 cylinder in-line units.

Economy—No engine compressor in this range is more economical. Low fuel consumption stems from the fact that sufficient exhaust gas energy is applied to give full turbocharged effect through *all* speeds and loads without added mechanical means for driving the supercharger.

Efficiency — Operating at relatively high compression ratio, the Turbo-Uniflo design affords much smoother combustion characteristics than other engines with lower compression ratios. This is due to the positively controlled timing arrangement, cylinder configuration and design of the exhaust manifolding.

For complete details on the SUTC turbocharged gas engine compressor, call your nearest Worthington District Office, or write: Worthington Corporation, Section 43-2, Harrison, New Jersey. In Canada: Worthington Canada Ltd., Brantford, Ont.

WORTHINGTON

compressor-user survey shows

FEATHER VALVE PREFERRED 2 TO 1!

FEATHER VALVE

VALVE A

VALVE B

A recent survey of compressor users put the amazing Feather*Valve first by far in all four operating categories —simplicity of construction, efficiency, low maintenance cost and quiet operation. In addition, the Feather Valve was picked as the preferred compressor valve 2 to 1 over the nearest competing type of valve!

The lightest, fastest-acting valve available, the amazing Feather Valve provides very sharp action with virtually no slip or back-flow. It works with no impact . . . has no buffer plates or cushioning devices. Practically indestructible it assures long life with negligible maintenance costs. When buying your next compressor, look into Worthington's complete line of Feather Valve units. Worthington Corporation, Harrison, N. J.

*REG. U. S. PAT. OFF.

WORTHINGTON

NOW IS THE TIME... stock up on **Roebling Royal Blue Wire Rope**... the dollars you spend today **guarantee tomorrow's profit.** There's never been a tougher, longer-lived wire rope than **Royal Blue.** On that basis alone, you can be sure that every dollar you spend for **Royal Blue** will go further. You will be able to count your profit later. Try **Royal Blue now**—find out for yourself.

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Subsidiary of The Colorado Fuel and Iron Corporation

ROEBLING
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DESIGN
FOR WIRE ROPE
Its ready adaptability is evident wherever power is transmitted. It conforms to unique design requirements. Use wire rope to transmit power.

Engineering Progress Report

FROM UNION CARBIDE CHEMICALS COMPANY

Side Stream Distillation Reduces Cost of Gas Sweetening Operations

Control monoethanolamine contamination by eliminating foreign materials

Monoethanolamine reacts with weak acids such as hydrogen sulfide and carbonic acid at ambient temperatures to form salts. Then, these salts decompose when heated to the boiling point of water, liberating the acidic gases and freeing the monoethanolamine for recirculation to pick up more acid gas. This provides an economic cyclic process for absorbing these undesirable materials from a gas stream. Because of this, practically all gas sweetening in the United States is accomplished by means of the ethanolamines. Union Carbide Chemicals Company's Technical Service Department is continually engaged in research designed to give better engineering service to users of CARBIDE's ethanolamines.

MOST UNITS ARE TROUBLE-FREE

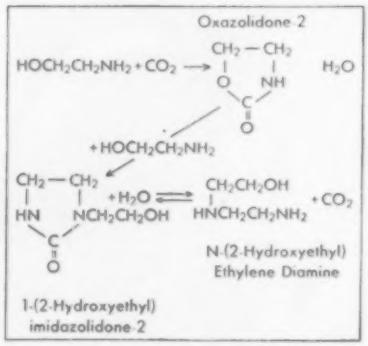
Most of these plants have operated for years without difficulty. However, experience with both aqueous-amine and glycol-amine solutions shows that in some plants the solution gradually loses capacity to absorb acidic gases and may become corrosive.

Research has shown that monoethanolamine contamination can be controlled by a simple side stream distillation system which removes foreign materials and amine degradation products. Thus, sewering can be avoided.

FORMATION OF AMINE DERIVATIVES

Examination of used aqueous and glycol-amine solutions led to the isolation and identification of two monoethanolamine conversion products, namely, 1-(2-hydroxyethyl) imidazolidone-2 and N-(2-hydroxyethyl) ethylene diamine.

It was found that this reaction actually takes place at a very slow rate in some plants handling carbon dioxide. A similar reaction



yielding similar products does not occur when only hydrogen sulfide is present.

EFFECT OF AMINE DERIVATIVES

Formation of imidazolidone reduces the effective monoethanolamine concentration and increases solution viscosity. High concentration may aggravate precipitation of residues in equipment. N-(2-hydroxyethyl) ethylene diamine will pick up acid gases, but release them only with difficulty. The acid gas salt of this stronger amine may contribute to plant equipment corrosion.

DEGRADATION PRODUCTS REMOVED BY SIDE STREAM DISTILLATION

Commercial experience proves that it is possible to remove the imidazolidone from fouled plant solutions by side stream distillation at atmospheric pressure. Batch-wise operation handling approximately 1 per cent of the circulated solution has been successful. Vacuum distillation equipment has been equally successful in the case of glycol-amine solutions.

While the substituted ethylene diamine can be efficiently removed in aqueous monoethanolamine systems, it can not be removed from diethylene glycol-monoethanolamine mixtures as its boiling point is within a few degrees of that of diethylene glycol.

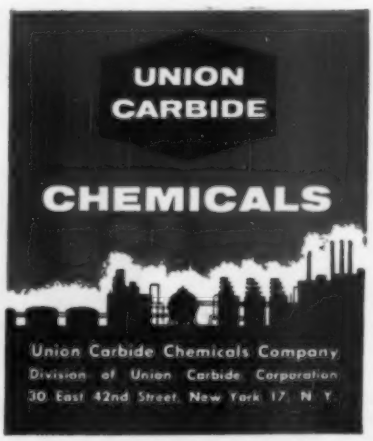
However, the imidazolidone and diamine are in equilibrium. Therefore, reduction of the imidazolidone concentration causes the diamine to revert to imidazolidone. This results in an ultimate removal of both the imidazolidone and the diamine.

In addition, side stream distillation also removes inorganic salts, organic materials with boiling points higher than monoethanolamine, and heat stable monoethanolamine-acid reaction products.

TECHNICAL SERVICE AVAILABLE

CARBIDE offers many technical services to the gas conditioning industry. If you have a gas treating problem, call the nearest CARBIDE technical representative or write Union Carbide Chemicals Company, Department B, 30 East 42nd Street, New York 17, New York.

"Union Carbide" is a registered trade-mark of Union Carbide Corporation



now operating in Venezuela

directional drilling, fishing or cutting, electrical well service and supplies

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OILFIELD · THE WORLD'S LARGEST INDEPENDENT · ROTARY SUPPLY AND SERVICE ORGANIZATION

DIRECTIONAL DRILLING
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ELECTRICAL WELL SERVICE

New York City, New York
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Long Beach, California
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GET THE JUMP ON FIRE
with Kidde extinguishing equipment!

PORTABLE EXTINGUISHERS

Left to right: carbon dioxide trigger, carbon dioxide squeeze valve, 2½ gallon foam, 2½ gallon pressurized water, 20-pound pressurized dry chemical, 20-pound cartridge-operated dry chemical, 2½ gallon pump tank, one quart pressurized VL. Also 1 gallon pressurized VL and 1 and 1½ quart pump VL.

Kidde hand portables are designed to knock fires out *fast*, come in a variety of types and models. The Kidde line includes carbon dioxide extinguishers with fast-acting trigger release or squeeze-valve release in capacities of 2½ to 20 pounds. Kidde dry chemical extinguishers can be had in pressurized models of 5, 10, 20 and 30 pounds capacity, and in cartridge-operated models of 20 and 30 pounds. Kidde wet chemical extinguishers (foam, soda-acid) are available in 2½ gallon bronze or stainless steel models, including cartridge-operated and pressurized water or water-anti-freeze units. Kidde vaporizing liquid extinguishers come in pump capacities of 1 and 1½ quarts, pressurized in 1 and 1½ quarts and 1 gallon. Kidde pump tank extinguishers, in steel or copper shells, are available in 2½ and 5-gallon sizes.

MOBILE EQUIPMENT

Left to right: 100-lb. carbon dioxide, 150-lb. dry chemical, 40-gal. foam. Also 40-gal. soda-acid.

For major fire hazards, get a mobile unit. Wheeled carbon dioxide units are available in 50, 75, and 100-pound capacities, in one cylinder. Shut-off valve located at nozzle gives operator complete control. 150-pound dry chemical unit has straight stream for long range . . . fan pattern for wide coverage. Single-lever control for "on," "off," "fan," or "straight" discharge pattern, 50 feet of hose. 40-gallon wheeled foam unit delivers more than ten times its liquid content capacity in fire-smothering foam. Ideal protection against flammable liquid fires. All give expert results even with inexperienced operator.

SMOKE AND FIRE DETECTORS, CARBON DIOXIDE SYSTEMS

Kidde Industrial Smoke Detectors give you a fire warning where it counts—at the smoldering start of a fire—tell you fire's location, give you a visible and audible alarm.

Kidde Atmo fire detecting and warning systems afford wide-area protection, are ideally suited for cases where early detection of fire in valuable materials is essential. Working on the principle of rate-of-temperature-rise, Kidde Atmo systems give warning at the first hot breath of fire, can be used to shut off fans, close doors, etc.—all automatically.

Kidde carbon dioxide extinguishing systems are individually designed to fully protect even the most dangerous hazards, use pneumatic control heads to insure instant and complete carbon dioxide discharge. Directional valves afford protection to more than one hazard using the same bank of cylinders. All operating parts are self-enclosed for safety. Visual indicators show at a glance if system is "set" or "released." Thermostatically-operated systems, and package systems for 6000 cubic foot flammable liquid hazards are available.

Kidde (K Kidde)

Walter Kidde & Company, Inc.
654 Main St., Belleville 9, N. J.
Walter Kidde & Company of Canada Ltd.
Montreal — Toronto — Vancouver

They Say—

'Twasn't hay in the air

Dear Sir:

I let the picture and size go by (in "Giant Vessel Goes Up in One Piece in a Hurry," April 14, p. 80) but in the May 12 issue, page 63, you take issue with us again calling our tower 121 ft. high.

I suggest that your engineer oil his slip stick. According to the April 14 issue, the derricks raising the tower were 155 ft. high. And, brother, that ain't hay sticking up in the air above the derrick (see picture April 14, p. 80). It is 53 ft. of tower which adds up to 208 ft.

One of your Cities Service Readers

Dear Sir:

I have just finished reading my May 12 issue of the Journal and when I read the They Say column I saw a mistake from the April 14 issue repeated.

Since Mr. McCann (writer of the May 2 letter) is attempting to clarify the record, I think it should be further clarified. The butane-splitter tower installed at Cities Service Refining Corp.'s Lake Charles refinery is 208 ft. high and 13⅔ ft. in diameter. The lifting weight was 215 tons exclusive of platforms, ladders, trays, etc.

This should set the record straight as to who holds the "mythical record."

Incidentally, the Southern Pacific Railway has since stated in the newspapers that this is the largest single piece of equipment ever moved over the American railroad system.

Claude A. Vincent, Jr.
Design Engineer
Cities Service Refining Corp.
Lake Charles, La.

Editor's note: It's the biggest! We erred. As we said last week, we meant to write 212 and it came out 121. We'll be forever sorry.

Memphis case needs action

"The U. S. Supreme Court moves with deliberate speed and few would want to hurry it unduly. But in the Memphis case it would seem that the court could get a move on without risking any miscarriage of justice or even any unseemly loss of dignity.

"The Memphis decision was handed down last October . . . Until the

Supreme Court makes a final decision, the vast gas industry is practically stopped in its tracks . . .

"The jobs which a revival of the gas business would create would be very helpful in these recession times. The Supreme Court is not prohibited from taking special social and economic conditions into consideration and has not hesitated to do so in other instances. The court should take another look and push this Memphis case ahead on its docket."

Editorial in the New York World-Telegram & Sun.

New bevel needs more work

Dear Sir:

Mr. Leonard J. (Shorty) Cunningham is to be commended for his pioneering effort in the development of better pipeline-welding techniques as described in the article "New Joint Design Is Needed in Pipeline Welding," in the March 10 issue (p. 144) of The Oil and Gas Journal.

The report describes laboratory and field tests comparing the 20° and 30° pipe bevel. There are several important features of the 20° bevel that should be indicated and considered . . .

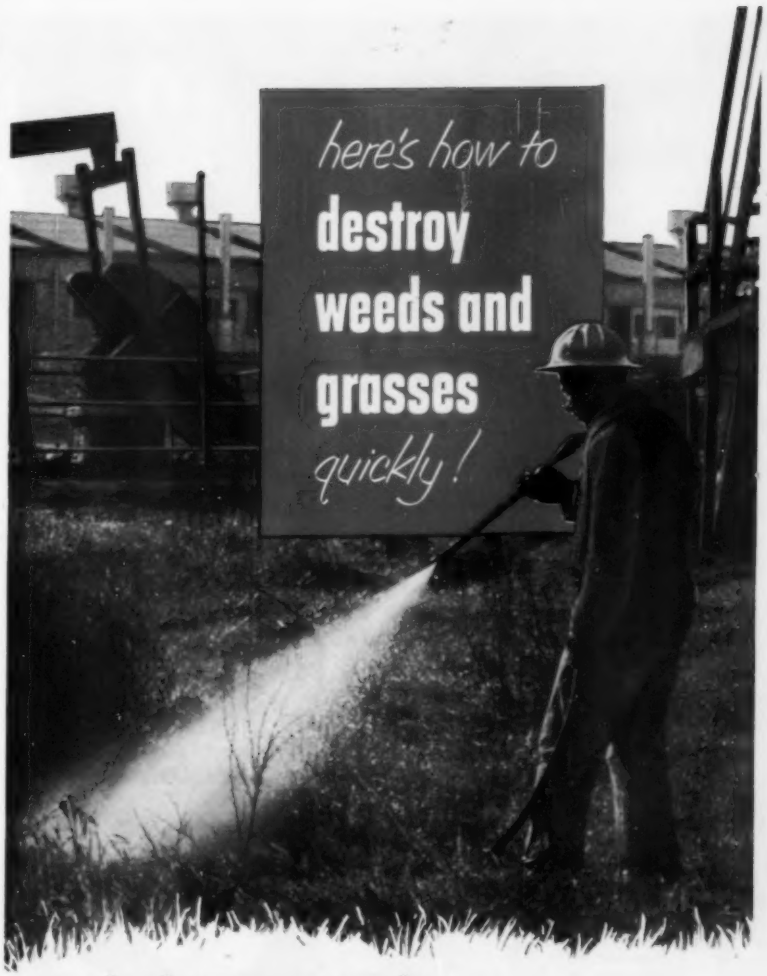
It was pointed out that the stringer bead in the 20° bevel was equivalent to the stringer bead and hot pass in the 30° bevel. This means that the stringer bead in the 20° bevel would cool off less rapidly than the stringer bead in the 30° bevel, but probably still at a sufficient rate to form martensite in the deposited weld metal. The disturbing thing is that the stringer bead is so large it is doubtful if the filler passes would heat treat the entire stringer bead to completely eliminate the martensite formation.

There has been some research work along these lines to indicate that when the stringer bead is large, the martensite near the inside surface is unaffected during the deposit of the filler passes. Underbead cracking is attributed to the formation of martensite.

Apparently, the carbon equivalent of the 16-in. pipe that was used in the field construction was relatively low, or I am sure there would have been underbead cracking as a result of the formation of martensite . . . It would be interesting to see a photomicrograph of several cross-sections of a completed weld made with 20° bevel.

In reviewing some of the X-rays, the width of the stringer bead appears to be smaller than that depicted on the cross-section shown in the report. There appears to be a greater tendency to have lack of penetration.

This tendency would be more pro-



protect your property against grass fires

by applying POLYBOR-CHLORATE®

FAST-ACTING
NONFLAMMABLE
NONSELECTIVE
ECONOMICAL
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Destroy *all* vegetation to get maximum safety. It's easy with POLYBOR-CHLORATE weed killer! This potent combination, borates and sodium chlorate, is unequalled for fast killing with safety. POLYBOR-CHLORATE is highly soluble; works well in any spray equipment but can be applied dry with equally effective results. Spraying is a quick way to destroy tall standing vegetation where mowing or scalping is not feasible. Residual effects, often preventing regrowth for a year or longer, mean added economy. Get full information by writing today!

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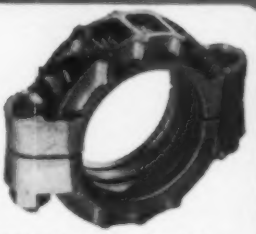
DISTRIBUTORS LOCATED THROUGHOUT OIL FIELDS OF U.S.A., CANADA, MEXICO, COLUMBIA, VENEZUELA.

grooved pipe connections ?

name the application—

gb GUSTIN-BACON has the coupling

GRUVAGRIP®



Made of rugged malleable iron, Gruvagrip is an easily-installed, reusable coupling for grooved pipe with working pressures up to 1,000 p.s.i. Maintains air-tight connection under misalignment up to 7°. Absorbs shock, vibration, ground motion, expansion and contraction.

GRUVAJOINT

Gruvajoint's low-cost companion for pipe with working pressure up to 500 p.s.i. Air, gases, water, oils, chemicals, processing fluids, pulverized minerals . . . G-B couplings are built for use with pipe carrying virtually any type of liquid or material.

RIGI-GRIP

The NEW G-B coupling for grooved pipe applications where complete rigidity of connection is desired. Rigi-Grip also is designed for pipe with working pressures up to 2,000 p.s.i. Ideal for tank battery hookups, LACT units, production headers and complete waterflood piping systems.

AND, G-B OFFERS YOU A COMPLETE, COMPANION LINE OF DEPENDABLE, FREE-FLOWING FITTINGS

G-B COUPLING PRODUCTS ARE AVAILABLE AT LEADING SUPPLY STORES EVERYWHERE

GUSTIN-BACON Manufacturing Company

210 W. 10th St. Kansas City, Mo.

Molded glass fiber pipe insulation

nounced as the wall thickness increases. I would also think there would be a greater tendency for wagon tracks between the stringer bead and first filler pass, which the X-rays substantiate . . .

A considerable amount of work is being done in the development of automatic welding equipment, but some additional efforts should be extended by the industry to develop the techniques suggested by "Shorty." The combination bevel seems to have real merit. Perhaps, the combination bevel would take the shape of a J-bevel or U-groove.

Robert S. Ryan
Supervisory Engineer
Columbia Gas System Service Corp.
Columbus, Ohio.

What makes an executive?

"What characteristics are we looking for in an executive? He must basically have a good understanding of the business he is in and skill in its methods and techniques. In the case of engineers this means he must have better than average technical ability.

"The executive must have the insight and analytical ability needed to appraise situations, consider associated factors, and recognize what is important. He must have good judgment, organizational ability, be able to work through others, and a broad outlook. Ability to lead, inspire, select, and develop people is essential.

"The executive must have an innate desire to excel, to be a leader, not a follower, to assume responsibility, not avoid it, to seek for continual betterment, to get things done. He must be 'tough minded,' having what might be termed 'mental tenacity.' He must have strength of character, a keen sense of fairness and intense loyalty to his company."

Dr. Carl O. Tongberg, president, Jersey Production Research Co., in an article, "Do Engineers Make Good Executives," in The Link, magazine of Carter Oil Co., May-June 1958.

CALENDAR

JUNE

2-4 University of Texas, short course and conference on automation and computers, University of Texas campus, Austin.

2-4 Petroleum Electric Power Association annual meeting Texas Hotel, Fort Worth.

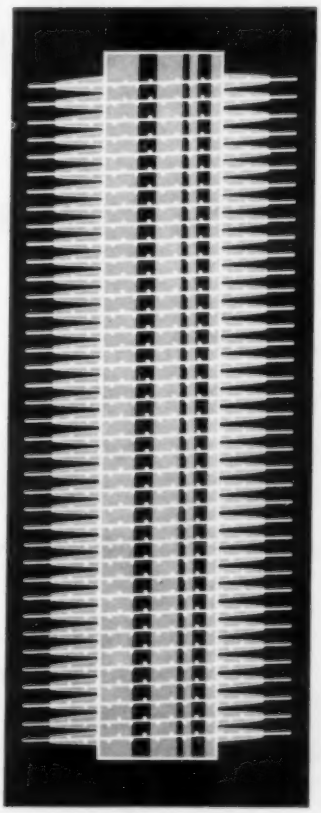
4-6 National Association of Corrosion

50,000%

METAL TRANSFERS HEAT MORE THAN 50,000% BETTER THAN AIR!

Assured Performance with

SMITHCO Metalbond FINTUBE



In mechanical bond finned tubes an air gap is always present between the fin and the tube which greatly reduces efficiency. Heat expansion loosens this bond and creates an even larger air gap which further retards heat transfer.

Air gaps are avoided in Smithco Air Cooled Heat Exchangers by employing metal as the bonding agent. This metal bond provides a smooth, unbroken flow of heat from tube to fin. Smithco *Metalbond* also provides against corrosion and has proven to be the most permanent bond yet devised.

SMITHCO
Engineering Inc.

P. O. BOX 3217
TULSA, OKLAHOMA

Seeing is believing . . .

FLOW PROPERTIES

Controlled best by **BAROID** *products and know-how*

When Baroid know-how prescribes mud treatment with performance proved products, the result is proper flow property control.

Baroid products and engineering are *your sure way* of obtaining mud flow properties that will give--

Faster cuttings removal
Less formation trouble
Better circulation
Faster drilling
Less equipment strain
Lower total drilling cost

BAROID

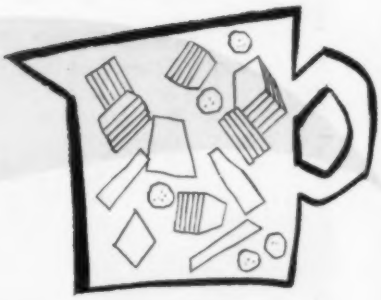
BAROID

control **number** *of particles in mud . . .*

by addition of solids,
dilution and chemical or
mechanical treatment

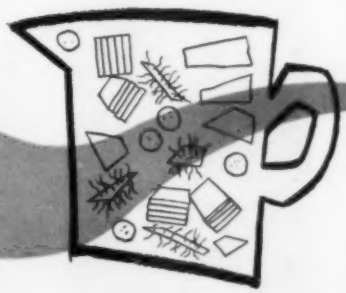
control **size** *of particles in mud . . .*

by controlling flocculation,
dispersion or aggregation
and by addition or
removal of solids



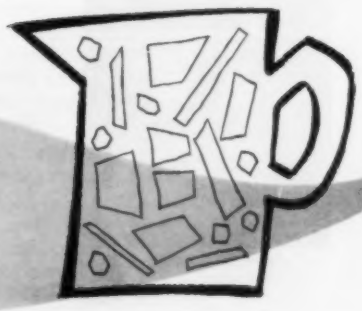
control **shape** *of particles in mud . . .*

by addition or removal
of particles and by
chemical treatment



control **dispersion** *of particles in mud . . .*

by chemical treatment to
increase or decrease
dispersion or aggregation



BAROID DIVISION NATIONAL LEAD COMPANY • MAIN OFFICE: P. O. BOX 1675, HOUSTON 1, TEXAS

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HYCALOG

WHAT HYCALOG DID ABOUT THE PASSED-UP SHOW

CONTINUING RESEARCH FOR LOWER COST EXPLORATION

A known producing area in Hidalgo County, Texas, had been passed up in 1954 by several well logging companies — but HYCALOG research engineers weren't satisfied until they discovered why.

Here's what they did:

Transported a CONSOLIDATED ELECTRODYNAMICS mass spectrometer to the well site . . . *the first field application of the spectrometer.*

Worked with BECKMAN INSTRUMENTS in developing a special portable mass spectrometer (the radio frequency analyzer) . . . *the first ever designed specifically for well logging.*

Developed the GAS CHRONOFRAC (patent pending) analytical recorder and included it as part of regular HYCALOG services . . . *at no extra cost.* With this instrument continuously repetitive analyses of samples are run on one-minute cycles. And component analysis is completed in less than two minutes . . . many times the speed of conventional chromatographic analysis.

Now . . . as a result of HYCALOG research . . . *the chance of running past a show has been virtually eliminated.*

Ask your HYCALOG *representative for information about* GAS CHRONOFRAC *analysis.*

Hycalog, Inc.

505 AERO DRIVE
SHREVEPORT, LOUISIANA

BRANCH OFFICES IN PRINCIPAL OIL PRODUCING AREAS

DIAMOND CORING • DIAMOND BITS • WELL LOGGING • CORE ANALYSIS

Engineers, Southwestern Louisiana Institute, second annual corrosion short course, Lafayette, La.

5-7 National Oil Scouts and Landmen's Association, annual meeting, Mayo Hotel, Tulsa.

8-11 American Petroleum Institute, Division of Transportation, annual tanker conference, Greenbrier Hotel, White Sulphur Springs, W. Va.

8-13 Society of Automotive Engineers, summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

10-12 Appalachian Underground Corrosion Short Course, School of Mines, West Virginia University, Morgantown, W. Va.

11-14 National Society of Professional Engineers, annual meeting, Chase & Park Plaza Hotels, St. Louis.

15-19 American Society of Mechanical Engineers, semiannual meeting, Hotel Statler, Detroit.

19 Pennsylvania Grade Crude Oil Association, annual meeting, Penhills Club, Bradford, Pa.

18-28 British Chemical Plant Manufacturers' Association, Council of British Manufacturers of Petroleum Equipment, chemical and petroleum engineering exhibition, London.

20 Southern Gas Association, transmission section, dispatchers' roundtable conference, Noel Hotel, Nashville, Tenn.

22-27 American Society for Testing Materials, annual meeting and exhibit, Hotels Statler and Sheraton-Plaza, Boston.

23-25 Interstate Oil Compact Commission, midyear meeting, Hotel Utah, Salt Lake City.

25-26 Western Petroleum Refiners Association, Mid-Continent regional technical-industrial relations meeting, Broadview Hotel, Wichita.

24-27 Canadian Gas Association, fifty-first annual meeting, Manoir Richelieu, Quebec.

28-July 2 Petroleum Equipment Suppliers Association, twenty-third annual meeting, Chateau Frontenac, Quebec.

JULY

23-26 Wyoming Geological Society, thirteenth annual field conference, Powder River basin.

AUGUST

11-14 Society of Automotive Engineers, National West Coast meeting, The Ambassador, Los Angeles.

19-22 American Institute of Electrical Engineers, general meeting, Sacramento.

25-27 Appalachian Gas Measurement Short Course, University of West Virginia, Morgantown, W. Va.

SEPTEMBER

7-12 American Chemical Society, fall meeting, Chicago.

10-12 National Petroleum Association, fifty-sixth annual meeting, Traymore Hotel, Atlantic City, N. J.

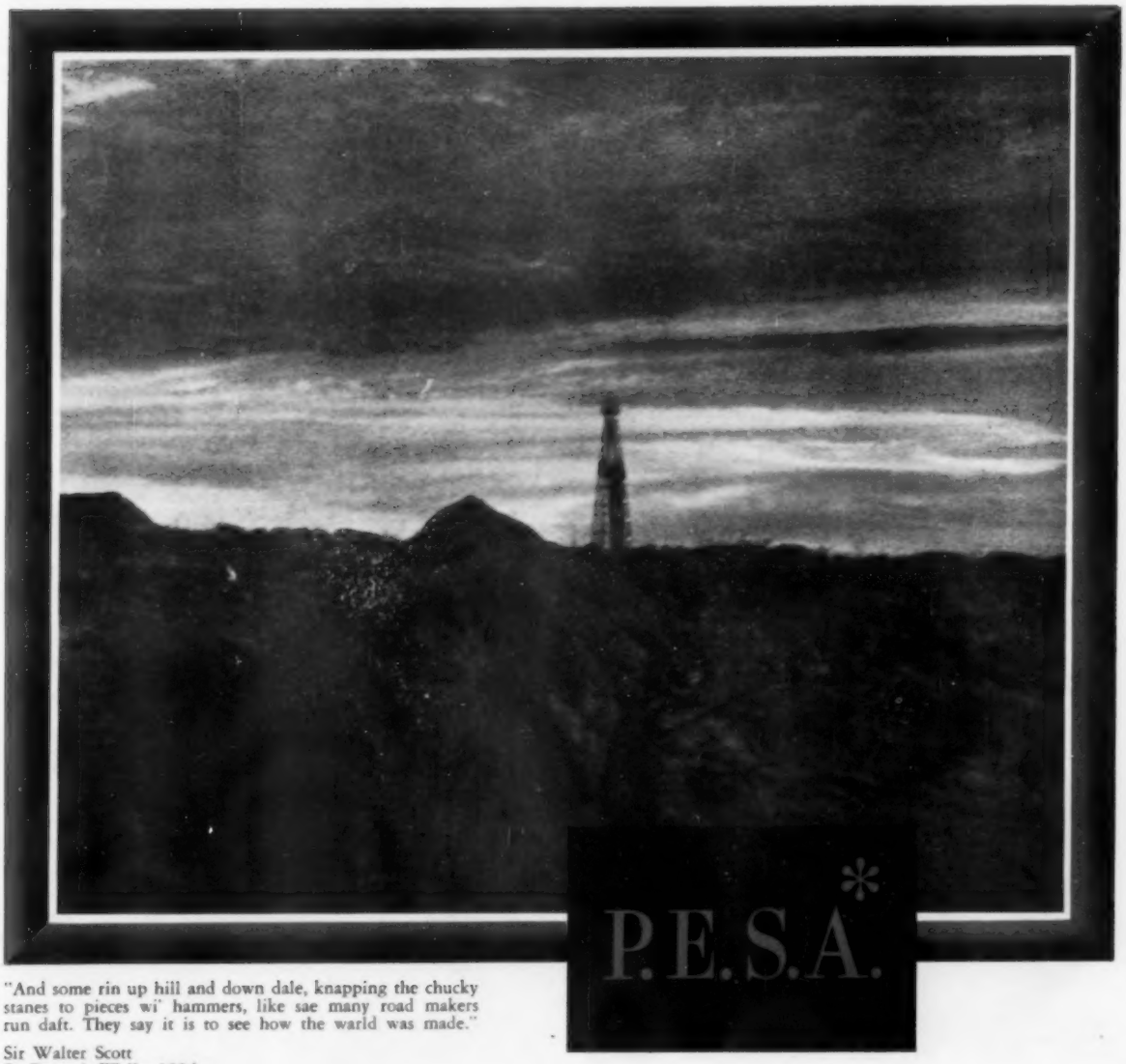
10-13 Intermountain Association of Petroleum Geologists, ninth annual field conference, Paradox basin.

15-16 Independent Natural Gas Association of America, annual membership meeting, Roosevelt Hotel, New Orleans.

15-17 American Institute of Electrical Engineers, conference on petroleum, Baker Hotel, Dallas.

18 Natural Gasoline Association of

Where In The World Will They Find Oil Next?



"And some rin up hill and down dale, knapping the chucky stanes to pieces wi' hammers, like sae many road makers run daft. They say it is to see how the warld was made."

Sir Walter Scott
St. Ronan's Well—1824

We have evidence of geologists at work in 1824. It was inevitable that the "rock breakers" would one day develop sciences that would be useful in the search for oil. Present day methods, however, would not be recognized by early day proponents of the art. And much credit must be given those who spent their lives in geological interpretation.

The practice of formation and surface feature study was followed by the torsion balance, the gravimeter, refraction and reflection seismic techniques. The first geophysical prospect (torsion balance) to be proved in the United States was on the Nash Ranch in Fort Bend County, Texas. A year later, the first seismic discovery was made at Orchard, Texas.

Since that time, geophysical crews have traveled the length and breadth of the world in the search for indications of gas and oil.

And wherever oil has been found, PESA Supply, Service and Manufacturing members have made their contributions to the development of oil fields throughout the world.

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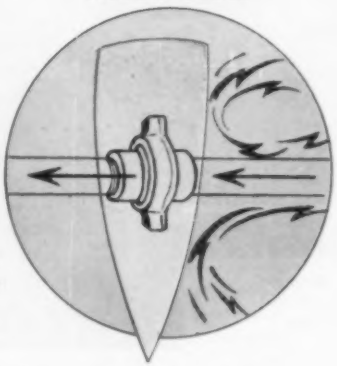

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America, Rocky Mountain regional meeting, Gladstone Hotel, Casper, Wyo.

21-24 American Society of Mechanical Engineers, petroleum division, mechanical engineering conference, Cosmopolitan Hotel, Denver.

24-25 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

25-26 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

29-Oct. 3 Society of Automotive Engineers, national aeronautic meeting, aeronautic production forum, and aircraft engineering display, The Ambassador, Los Angeles.

OCTOBER

1-2 Western Petroleum Refiners Association, third annual stream-pollution and waste-disposal conference, Lassen Hotel, Wichita.

1-3 American Association of Oilwell Drilling Contractors, eighteenth annual meeting, Adolphus and Baker Hotels, Dallas.

5-8 Society of Petroleum Engineers of AIME, fall meeting, Houston.

5-8 National Association of Corrosion Engineers, northeast region, Somerset Hotel, Boston.

7-8 Texas Mid-Continent Oil and Gas Association, annual meeting, Statler-Hilton Hotel, Dallas.

12-18 OIL PROGRESS WEEK.

13-17 American Society of Civil Engineers, annual convention, Hotel Statler, New York.

13-15 American Gas Association, annual convention, Atlantic City, N. J.

13-15 American Society of Mechanical Engineers, American Society of Lubricating Engineers, conference on lubrication, Statler Hotel, Los Angeles.

13-16 Society of Exploration Geophysicists, annual meeting, Hotel Gunter, San Antonio, Tex.

15-16 South Dakota Independent Oil Men's Association, convention, Sheraton-Johnson Hotel, Rapid City.

15-17 National Association of Corrosion Engineers, north central region, Cincinnati.

16-17 Society of Petroleum Engineers of AIME, Southern California petroleum section, Biltmore Hotel, Los Angeles.

19-21 National Association of Oil Equipment Jobbers, annual convention and trade show, Hotel Adolphus, Dallas.

20-24 National Association of Corrosion Engineers, south central region, Roosevelt Hotel, New Orleans.

22-23 National Association of Corrosion Engineers, western region, corrosion control course, U. S. Grant Hotel, San Diego, Calif.

22-24 Southwestern Federation of Geological Societies, technical meeting, Mineral Wells, Tex.

22-24 Society of Automotive Engineers, national diesel engine meeting, Lord Baltimore Hotel, Baltimore.

23-24 Western Petroleum Refiners Association, refining technology and industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

27-28 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

26-31 American Institute of Electrical Engineers, general meeting, Pittsburgh.

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- **Eliminates Manual Bleeding**
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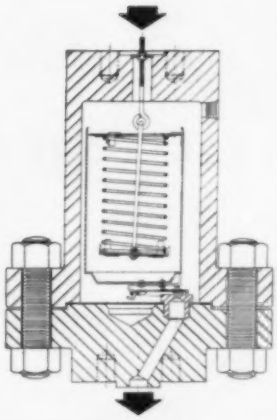
How It Works

Bucket is first primed with water, the weight of which compresses spring and closes valve. As condensate enters at top, it spills over side of bucket and begins to fill body of trap. When level gets about half-way up bucket, buoyancy of bucket plus spring action overcomes pressure and lifts bucket, opening valve. As condensate discharges, bucket loses buoyancy and sinks, closing valve. Valve *always* closes before all condensate is discharged, thus assuring a perfect water seal at all times.



4 SIZES

Trap No.	2315-S	2415-S	2515-S	2615-S
Max. Pressure	1000 lb	2000 lb	3000 lb	3500 lb
Capacity at Max. Pressure	7000 lb/hr	4200 lb/hr	5000 lb/hr	300 lb/hr
Pipe Connections	1", 1¼", 1½"	1", 1¼", 1½"	1"—1¼"	1"—1¼"

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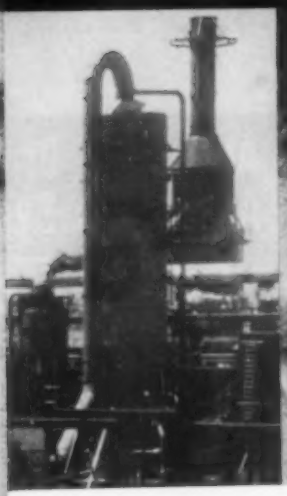

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING

Return of the Red Man

THE TROUBLES that oil operators are having in leasing lands from the Indians in the Four Corners area may arouse sympathy in most of the oil patch, but they get a somewhat different reaction in eastern Oklahoma.

If you're up on your history—or TV programs—you will recall that until 50 years ago eastern Oklahoma was Indian Territory, and that for two generations before it was the home of the Five Civilized Tribes. These tribes really were civilized. They had their own towns, governments, newspapers, and schools. When white men started moving in the Indians either treated them as invited guests or looked down on them as poor white trash, depending on how they behaved themselves.

The result is that in these parts the Indians always considered themselves as masters of the situation, and a cut above the Johnny-come-latelys. So today in Tulsa and other cities in this area some of our leading citizens are Indians, and proud of it. It always astonishes visitors to be told, as an example, that the Principal Chief of the Cherokee Nation (an elective office) is also a vice president of Phillips Petroleum Co.

We have several Indians working for The Oil and Gas Journal. The most outspoken of the lot is our assistant news editor, Carl Lawrence. Carl is practically a professional Indian. He loudly complains that the "adult westerns" on TV don't portray "his side" in the proper light, and he does so much bragging about his ancestry that his colleagues accuse him of trying to get revenge on the white race whenever he scalps and massacres their stories with his copy pencil.

Carl sheds crocodile tears every time he reads that some oil company is complaining about being mistreated by the Indians. But reticence and silence are a couple of alleged Indian characteristics that Carl didn't seem to inherit, so he advertises his feelings with war whoops. For example, the other day he posted this bulletin:

"Put another feather in the Navajo's headdress. According to last week's Journal, some poor oil operator is complaining that the Indians are pulling a quickie. He says, so the story goes, that he offered the tribe a bid for a lease, but they held it up until a well could be drilled on an adjacent tract. When the offset came in as a producer, the Indians turned the bid down as insufficient.

"Now he is complaining. He probably thinks that he, like his forefathers, can offer the Indians a few beads and trinkets and expect to get Manhattan Island in exchange.

"The day of reckoning is here; the Red Man is returning."

It does appear, from this incident, that the Noble Red Man has learned a few leasing tricks from the Noble Oil Man.

But Carl Lawrence's bleeding heart probably won't stop palpitating until the Navajos duplicate the sage of the Osages—which is one of history's most ironic jokes on the White Man. The Osage Tribe was herded out of the good farming regions to the north into the least promising section of Indian Territory. And since the Osages were far more primitive than the Five Civilized Tribes they were ruled from Washington as wards of the Government.

So when oil was discovered in what is now Osage County, Oklahoma, the Great White Father was right on the job to prevent any leasing shenanigans. As a result the Osages got higher bonuses and royalties than almost any white man ever got. In the past 40 years or so they have taken in more than $500,000,000 from the oil rights to their "worthless" reservation, and the money is still coming in.

There are scores of amusing stories about how this sudden wealth caused individual Osages to make as big fools of themselves as some of their white brothers do under similar turns of fortune. But those days are gone.

In Oklahoma it's not a question of the return of the Red Man. He never left. Today, except when they dress up for festive occasions, you have to poke into remote corners of the state to find any Indians you would quickly recognize as such. Unless you run into one who is constantly on the warpath, like the Journal's Indian.

—Henry D. Ralph

Another successful use for BAKER Packers... parallel string installations

Baker Retainer Production Packer Product No. 415-D

FEATURES

Holds any pressure from either above or below that is safe for the casing, even under temperatures in excess of 300°F.

Pack-off is independent of set-down weight or tension. Tubing string is free; just pick up (or unlatch and pick up) to remove it.

Use it as a squeeze and testing tool or as a temporary or permanent bridge plug in conjunction with any production application.

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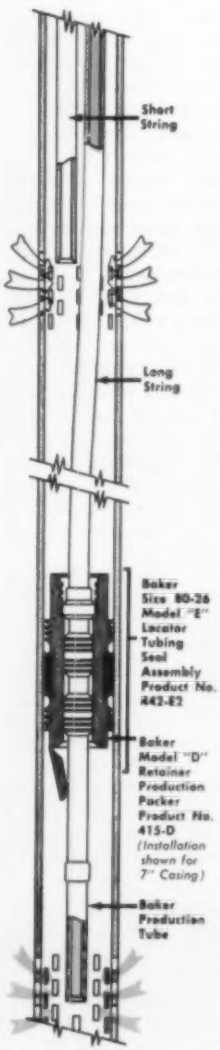
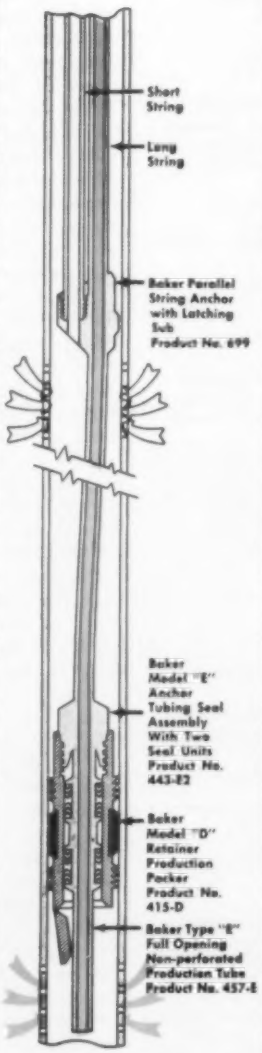
DUAL ZONE parallel string SHORT STRING HANGING FREE


Short String
Long String
Baker Size 80-26 Model "E" Locator Tubing Seal Assembly Product No. 442-E2
Baker Model "D" Retainer Production Packer Product No. 415-D (Installation shown for 7" Casing)
Baker Production Tube

Permits removal of either string independently of the other regardless of sequence. Full-Opening (Tubing I.D.) Long String to lower zone.

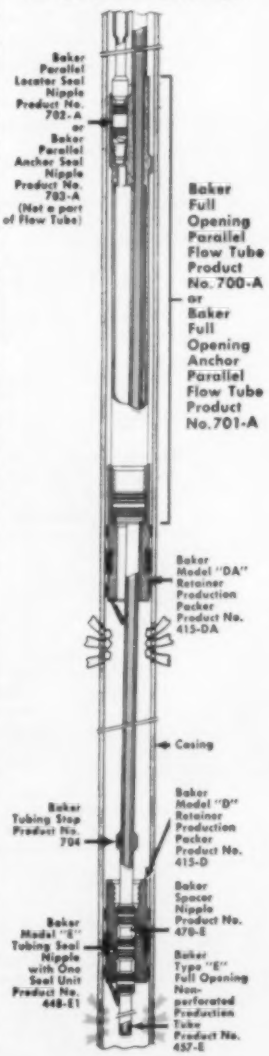
DUAL ZONE parallel string SHORT STRING ANCHORED


Short String
Long String
Baker Parallel String Anchor with Latching Sub Product No. 699
Baker Model "E" Anchor Tubing Seal Assembly With Two Seal Units Product No. 443-E2
Baker Model "D" Retainer Production Packer Product No. 415-D
Baker Type "E" Full Opening Non-perforated Production Tube Product No. 457-E

Permits removal of either string independently of the other, however long string must be run first. Short string pulled first. Full-Opening (Tubing I.D.) Long String.

DUAL ZONE parallel string TWO-PACKER HOOK-UP*

**Ask for details of "Retrievable Upper Packer" installations, and other parallel string hook-ups.*


Baker Parallel Locator Seal Nipple Product No. 702-A or Baker Parallel Anchor Seal Nipple Product No. 703-A (Not a part of Flow Tube)
Baker Full Opening Parallel Flow Tube Product No. 700-A or Baker Full Opening Anchor Parallel Flow Tube Product No. 701-A
Baker Model "DA" Retainer Production Packer Product No. 415-DA
Casing
Baker Tubing Stop Product No. 704
Baker Model "D" Retainer Production Packer Product No. 415-D
Baker Spacer Nipple Product No. 470-E
Baker Model "E" Tubing Seal Nipple with One Seal Unit Product No. 448-E1
Baker Type "E" Full Opening Non-perforated Production Tube Product No. 457-E

Illustrates Two-Packer parallel string installation with each zone confined to its individual tubing string with full-opening to lower zone for use of all permanent-type completion tools.

When allowables go up, they should go up right

THE Oklahoma Corporation Commission is making slow progress toward clearing the underbrush from its proration jungle. But very slow.

Much of the time during the past several years the state has produced considerably more oil than the market could absorb. This resulted in purchaser proration, unconnected wells, and general dissatisfaction among producers and buyers alike.

Three months ago the commission did make a substantial cut in allowables, under the pressure of the unmanageable oversupply and the heroic example of Texas in taking drastic action to bring correction.

GOOD RESULTS ARE SHOWING UP already. Purchasers of Oklahoma crude have been able to get their inventories down to workable levels. Purchaser proration is disappearing, trucked oil is finding a market, a few new pipeline connections are being made, there is some spot crude buying, and producers' underages are being made up.

But to accomplish this, Oklahoma had to resort to an improvised allowables schedule that is intricate to apply, unpredictable in its results, and so inequitable as to be of doubtful legality.

Whether Oklahoma's cut this spring was too little and too late is now water over the dam. The supply-demand situation appears to be improving to where production east of the Rockies is about where it should be.

The point is that Oklahoma did the right thing in the wrong way. Now the question is whether the state will do the right thing in the right way as demand for domestic crude begins to increase.

The temptation for all prorating states will be to ease up on allowables too fast. And in some the tendency may be to give the biggest increases to those classes of producers who make the most noise or bring the most political pressure. Oklahoma's problem is complicated by its need to put more realism and more teeth into its loose, archaic allowables schedule.

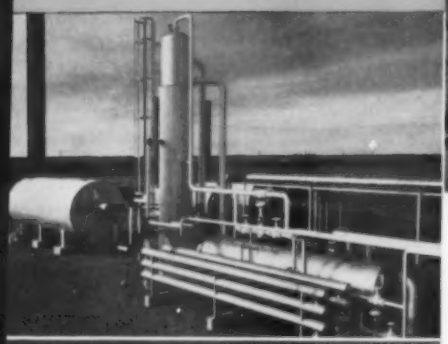
The easiest way for Oklahoma to eliminate some of the inequities is simply to raise allowables up to about each well's productive capacity. This could result in again swamping purchasers and upsetting the delicate supply-demand balance during the critical period of the next few months.

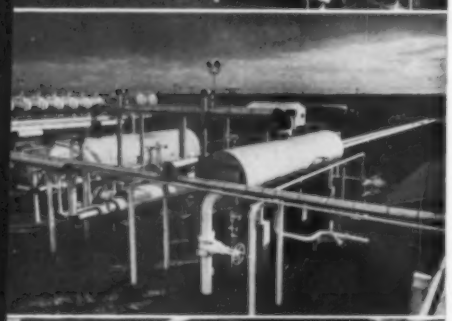
THE BIGGEST NEED is to use this period of cautious readjustment to a better market by patching up the defects in the proration system.

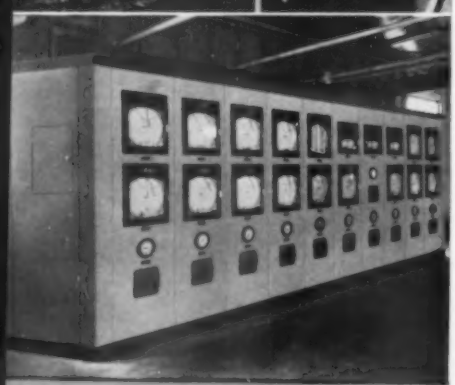
It should be flexible enough to meet future crises and predictable as to its results, as well as protecting correlative rights and encouraging development of reserves.

The right thing for Oklahoma—and all other states—is to hold production closely to actual demand. The right way to do it is to restore balance and equity in the process.

Here's The "New Look" In Gasoline Plants! . . .







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This plant—designed, manufactured and constructed by BS&B for Kansas-Nebraska Natural Gas Company, Inc.—uses 400 tons of refrigeration supplied by a BS&B Ammonia Absorption Refrigeration Unit to cool both the lean absorption oil and the inlet gas.

Gas enters at 800 psig and 110° F. with a water dew point of (—20° F.), and is passed through water to gas heat exchangers and gas to gas heat exchangers to bring the temperature down to approximately 30° F. It is then further cooled by the ammonia absorption refrigeration unit to 0° F., and enters the bottom of the oil absorber to drop out liquid condensed during the cooling period.

In the oil absorber, the gas at 0° F. is contacted with 140 molecular weight lean oil (also at 0° F.) at a circulation rate of approximately 2.3 gal./1000 SCF. The gas is then warmed to approximately 85° F. before going to the sales line, while the lean oil and absorbed hydrocarbons are passed through conventional fractionation equipment to produce propane, butane and natural gasoline.

PRODUCTS RECOVERED
PROPANE—25,258 gal./day
BUTANE—7,987 gal./day
GASOLINE 14#—6,009 gal./day

INLET GAS COMPOSITION (35 MMSCFD)	MOL. %
N_2	3.24
CO_2	1.37
C_1	80.86
C_2	8.73
C_3	4.43
iC_4	0.34
NC_4	0.57
iC_5	0.17
NC_5	0.17
C_6+	0.12
	100.00

For more information on the applications of BS&B Ammonia Absorption Refrigeration in gasoline plant construction, contact your BS&B Man—or write to . . .

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the OIL AND GAS JOURNAL

▶ ▶ ▶ News Section

Phillips Breaks Drilling-Depth Record

• This history-making Pecos County wildcat has 11,600 ft. of open hole. The operator was forced to whipstock at nearly 20,000 ft. But prospects for a producer are still encouraging, despite much drilling to be done.

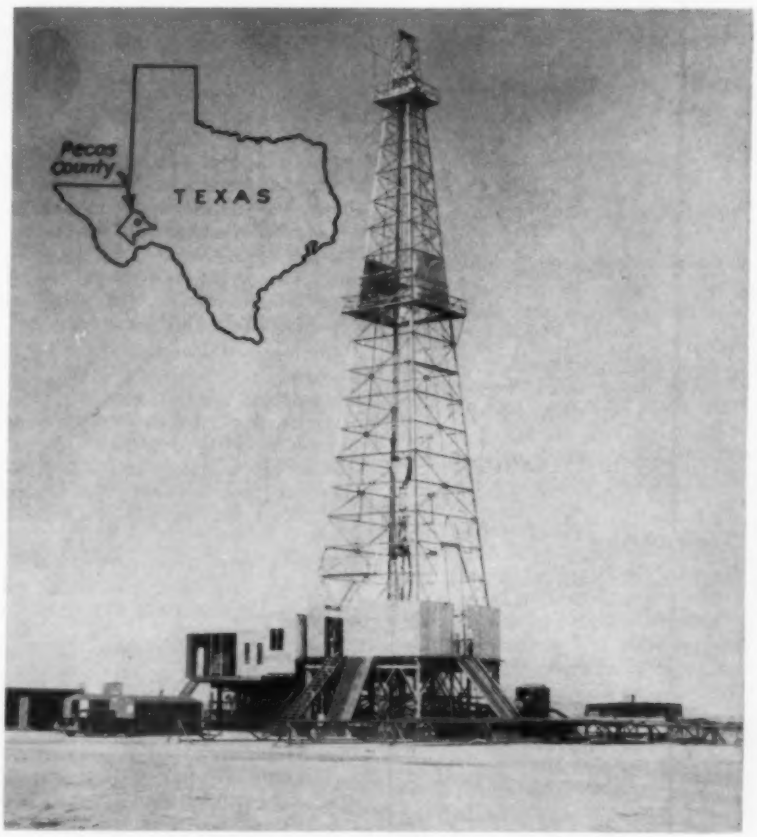
PHILLIPS Petroleum Co.'s new world depth champion—the 1-EE University in Pecos County, Texas—is churning toward 23,000 ft. with more than 11,600 ft. of open hole.

The monumental drilling job by the Phillips crew is a costly one, but Phillips geologists are still hopeful of hitting a deep pay.

Problems that beset the Phillips organization have been tough ones. The geology has been tricky and so has the drilling.

The 1-EE University cut its way into the history books at 8:25 p.m., May 26, when it passed the former 22,570-ft. depth record set in 1956 by Richardson & Bass in South Louisiana (OGJ, Dec. 26, 1955, p. 130, and May 14, 1956, p. 101).

At this point, the test had not yet reached its prime objective, the base Ellenburger formation. It was still in the Montoya-Silurian-Devonian, just above the Simpson, with the Ellenburger perhaps as much as 2,000 ft. away.



PHILLIPS' record well is in West Texas' Pecos County . . .

The crisis . . . On its way to fame, the 1-EE University had one major setback.

On January 4, at 21,397 ft., while the drillers were making a trip, the strain on the drill pipe became too great and it parted in the body of the pipe. The bit was 3,600 ft. off the bottom.

The drillers started backing off at 16,000 ft. and recovered fish until reaching 19,986 ft., where it was impossible to get any more. It was decided to plug and whipstock by the fish. At that time the hole was approximately 4° off vertical—not unusual for a deep hole in West Texas. A satisfactory cement plug was secured on the first attempt by using Diacel LWL and sand with the cement.

After reaming uphole, the operators tried their first whipstock but failed when the drill pipe twisted off after 35 ft. The second try, at 19,965 ft., was successful. The depth of the whipstock is believed to be a record.

The second hole is about 100 ft. from the first and has been up to 9° off vertical. Currently it is about 6° off.

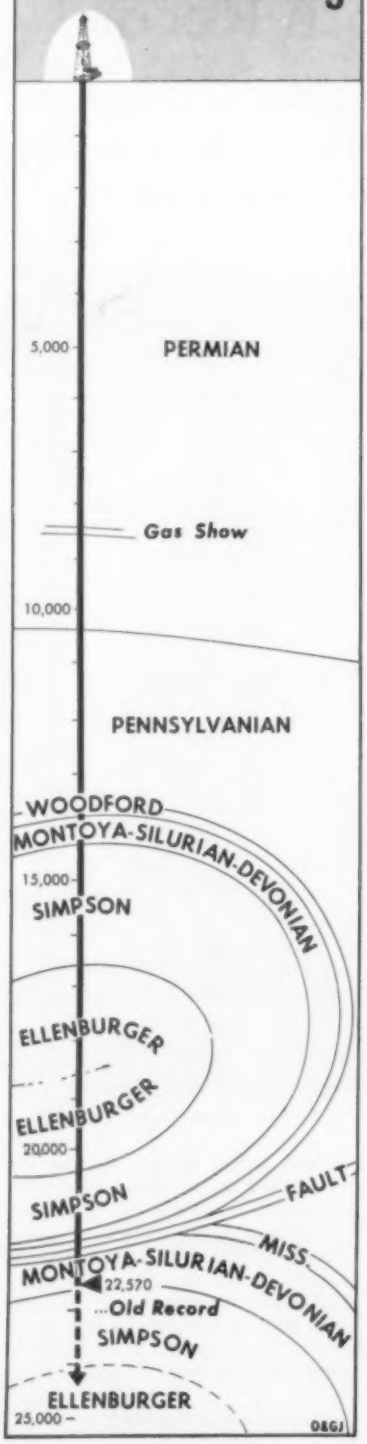
Open hole . . . 1-EE University's operators have taken a calculated risk in having open hole from 10,996 ft. to its present depth.

When drilling started, they did not contemplate that the well would go to anything like 22,000 ft., but when this became necessary they decided to keep an 8½-in. hole in preference to running new liner.

Casing so far consists of 20-in. to 1,480 ft., and intermediate strings of 13⅜-in. to 6,020 ft. and 9⅝-in. to 10,996 ft. The next casing will be 7-in.

Drill pipe is a combination of 4½ in. to 12,060 ft. and 4 in. beyond.

The Deepest Well
• Where It's Been
• Where It's Going



The 4½ in. is 8,760 ft. of 16.60 lb. internal upset Youngstown X-95 grade, and the 3,300 ft. of 16.60 lb. Grade E. The 4 in. is 14 lb. internal upset Grade E.

Round trips take up to 11½ or 12 hours. Bits have been left in the hole for as much as 94 hours or as little as 20 to 24 hours. It takes about 6 hours to get a sample off the bottom.

Phillips is using the Hughes R-I-J bit principally. It's a hard-formation bit that can stay in the hole a considerable period.

Equipment . . . Most of the rig equipment is National. It includes a 136-ft., 800,000-lb. derrick, to which relegs have been added. It has a 130 draw works and three L-400 Le Roi gas engines. Two pumps driving off the compound are an E-700 and a C-350.

The 500-ton traveling block is capable of stringing 12 lines of 1⅜-in. size.

The well has a powerful set of blowout preventers. It has a Shaffer 10-in. 1500-series double hydraulic ram-type preventer that tests at 10,000 psi. or 5,000 psi. working pressure. Also it has two 10-in. Hydril Type GK preventers, testing to the same pressure as the ram type.

One unusual operation at the 1-EE University is home-grown. Phillips developed, and used for the first time, a device that eliminates the use of slips in handling drill pipe. It consists of two elevators and a hydraulic shock absorber unit. The system works most satisfactorily at excessive depths.

Drilling mud used below the 9⅝-in. casing has been low solids oil emulsion Driscose mud with graphite added. Characteristics of the mud are as follows: Weight, 10.2 lb. per gallon; viscosity, 47-50 seconds; and water loss, 5-6 cc.

Circulating pressure at the present time approximates 1,800 psi.

The only temperature surveys available at the present are 196° at 11,000 ft., 330° at 15,700 ft., and 369° at 19,400 ft.

Who's in charge . . . The operation at the 1-EE University is so big that Phillips has two rig superintendents, J. R. Jackson and C. A. Parsons.

Keeping close tab on the well are Wade Ramzy, Phillips West Texas drilling division superintendent at Odessa, and H. W. Patterson, superintendent for all Phillips drilling at Bartlesville.

Where it is . . . Phillips geologists carefully picked the spot to spud the 1-EE University on October 12, 1956.

The well is located on an 8,160-acre lease block of University of Texas land and is the first drilled on the lease.

The nearest Ellenburger production is 13 miles north at a depth of 4,500 ft. The Ellenburger also was found in a dry hole 4½ miles northwest, where the formation was topped at 7,600 ft.

The well is 12 miles northwest of the Puckett-Ellenburger pool, which produces at 14,000 ft., and 9 miles northwest of Phillips' 1 Harral-A, now drilling to the Ellenburger expected at 18,000 ft.

Spot location of the 1-EE is Section 7, Block 24, University Lands, 1,980 ft. from the north and east lines, in Pecos County, about 8 miles east of Fort Stockton.

The geologists expected to find the main Ellenburger at about 20,000 ft., but they ran into a surprise overthrust of the formation before hitting 17,000 ft. and consequently drilled through the Ellenburger twice before returning to the Simpson, encountered once before (see chart).

The main Ellenburger is expected before the hole reaches 24,500 ft.

Shows so far . . . No spectacular shows have occurred to date.

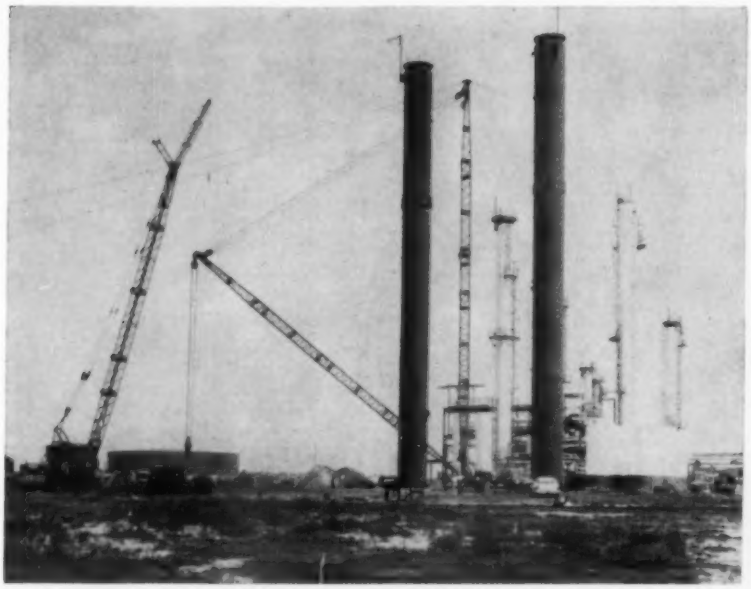
Several drill-stem tests have been taken—but none at great depth. The best test was the first one. It indicated possible commercial gas at 8,549-8,647 ft. in the Permian. The tool was open 2 hours, and gas reached the surface in 8 minutes at a rate of 1,000,000 cu. ft. per day. The pipe was reversed out so there was no recovery of any fluids in the drill pipe.

R. C. Charles, Midland division development geologist for Phillips, is in charge of the geology at the well. Charles works under the direction of Edwin Van den Bark, southwest regional manager of the land and geological department for Phillips at Bartlesville.

The outlook . . . The geologists don't expect to find the Ellenburger objective until it is well past 24,000 ft., and the drilling operators are preparing to go that far.

New liner probably will be set at around 23,000 ft. At that point the well would have more than 12,000 ft. of open hole.

Whatever happens from here on, the Phillips crew will be setting records every day they drill. And they hope to set the best one yet—production at the greatest depth ever drilled.



Suntide Adding Petrochem Unit

NEW ORTHO-XYLENE facilities being built at the Corpus Christi plant of Suntide Refining Co. will broaden and improve the company's participation in the petrochemical field.

A two-tower fractionation train (photo) under construction will make it possible to remove practically all of the o-xylene from a mixed xylenes stream being sold primarily for its para-xylene content.

Upgrading of the p-xylene stream in this manner will increase its selling price from about 17 cents per gallon under present conditions to more than 22 cents per gallon. At the same time, the o-xylene will be available for sale as a separate product.

The fractionation facilities also will be available for other possible service and permit increased diversification into petrochemicals, according to Floyd Martin, Suntide president.

Suntide, which operates a 75,000-bbl. refinery, got into the petrochemical business last winter with addition of a Udex aromatics extraction plant to its Platformer-Unifiner completed in the fall. Suntide has been expanding its production of benzene, toluene, and xylenes since that time, having the 5,000-bbl. extraction unit as the source.

Under present conditions, the mixed xylenes stream contains ortho-, meta-, and para-xylene, plus some ethylbenzene. About 15 to 16% of this is o-xylene. With completion of the new facilities, expected this July, this content will be reduced to a maximum of 2%.

Separation problem . . . Narrow boiling ranges make separation of the xylenes a complex problem.

Separation of the para- from the meta-, for instance, requires a low-temperature, fractional crystallization process, since the two isomers boil within 1° of each other.

There is about a 9° (F.) difference in the boiling points of these two isomers and the o-xylene. So it is possible to separate the o-xylene, with sufficient fractionation ability. This will be obtained through use of the two 60-tray towers operated in series.

The series operation will provide a total of 120 trays to effect the required separation. The feed to the 1,500 bbl. per day towers will enter on the 51st tray from the top and straight fractionation will take place. An extremely high reflux rate will be used to insure purity of the product. The two towers will be equipped with a 31 million BTU reboiler to maintain temperature.

Each tower is 10½ ft. in diameter, 136 ft. long, and equipped with a skirt to provide an over-all tower height of 150 ft. The towers will be connected bottom-to-top and top-to-bottom to act as one, with a 24-in. vapor line used between the two.

Design of the system calls for removal of 200 to 300 bbl. of o-xylene from the bottom, with the remainder of the 1,500-bbl. charge going overhead as specification product.

The towers will be equipped with Koch Flexitrays. Universal Oil Product Co., Inc., designed the fractionation section. Total cost is estimated at $750,000.

Rowan Sells Assets

to Texas Pacific Coal & Oil in $9,639,000 stock deal.

TEXAS PACIFIC Coal & Oil Co. will acquire all assets of Rowan Oil Co. through a $9,639,000 stock deal.

Rowan stockholders approved the acquisition last week, following earlier approval by directors of Texas Pacific. Both firms headquarter in Fort Worth.

Texas Pacific will swap 275,408 shares of its stock for Rowan assets which include:

. . . 7,000,000 bbl. of oil reserves in Louisiana, Texas, and New Mexico.

. . . Oil production which averaged 1,360 bbl. daily in 1957 from interests in 142 producing wells.

. . . Gas production averaging 8,991,000 cu. ft. daily last year from interests in 21 gas wells.

. . . Interests in 15,000 acres of productive leases.

. . . 41,000 acres of undeveloped leases.

. . . $2,500,000 worth of liquid assets, including accounts receivable, equipment, cash, securities, and inventories.

H. B. Fuqua, board chairman and president of Texas Pacific, said the company figures its investment in the Rowan properties can be paid out within 4 years, with a reduction of only about one-third of their present value.

Arch Rowan, chairman of the board of Rowan, also expressed satisfaction with the deal.

"We don't feel that we are selling to Texas Pacific. We feel we are buying in with them."

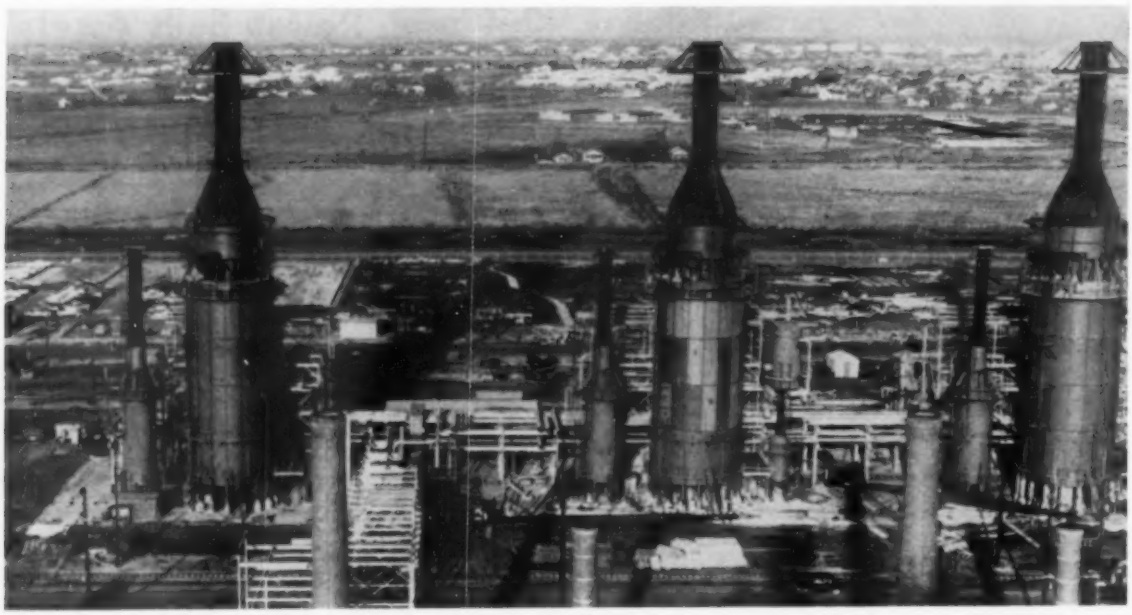
Rowan Oil was founded by Arch and his brother, C. L. Rowan, in 1923. Arch is regarded as an industry pioneer. He is a member of the National Petroleum Council and a director of numerous oil organizations.

IPE Already Sets Record

THE 1959 International Petroleum Exposition in Tulsa is a year off, but it's already beginning to look like a record-breaking show.

Exhibit space sales for the May 14-23, 1959, event have topped the 1953 sales record, and officials expect a complete sellout by January.

An estimated 32,000 oil men, buyers, and specifiers of oil-field and refining equipment and services are expected to attend. This is nearly 4,000 more than attended the last exposition in 1953.



EXPANSION at Neches Butane Product Co.'s Port Neches, Tex., plant is more proof that . . .

U. S. Has Overbuilt Butadiene Industry

THE U. S. PETROCHEMICAL industry has too much butadiene capacity.

When the recession ends, there still will be too much. Most authorities now think butadiene capacity will exceed U. S. and world demand for the next 7 years.

With the auto business in the doldrums, today's butadiene plants are operating at something like 56% of capacity, according to the best estimates available.

And for the future, even with an upturn in the economy, production can hardly expect to approach capacity—barring, of course, a war or other crisis.

War and postwar . . . Tied in directly with the manufacture of tires and other automobile parts and accessories, the comparatively new butadiene industry got its start in World War II when the Government started making synthetic rubber on a big scale. With butadiene as the chief ingredient, the growth in butadiene production was inevitable—particularly after the industry proved synthetic rubber to be a worthy competitor of natural rubber.

In the postwar period, under government ownership, the butadiene industry just barely rocked along since there was little incentive for expansion. Then, with the sale of the government plants in 1955, a big round of expansion was set off. This just about doubled capacity in a space of 2 or 3 years.

But the forecasts proved overenthusiastic; the industry overbuilt; and then came the business recession.

Today's butadiene capacity is estimated at about 1,163,000 short tons per year. This includes a 110,000-ton expansion nearing completion at the Neches Butane Products Co. (Goodrich-Gulf and Texas-U. S. Chemical) plant at Port Neches, Tex. (see photo).

But production is estimated at only 650,000 tons per year—or about 56% of capacity. There will be some pickup late this year when car makers start producing their new models, but even then production is expected to hit a rate of 700,000 tons a year, or about 60%.

The current decline . . . It takes no crystal-balling to find out why current butadiene demand is off.

Ninety per cent of the butadiene produced today goes into transportation.

Biggest single use is in tires, but a large volume also goes into other parts of the car. And fewer cars are now being built. Not only that, the public is running its old tires longer on its old cars.

"We have a recession complex," explained one marketing expert. "People not only are failing to trade in their old cars; they're not trading in their old tires either. If a car owner has 5,000 or 6,000 miles left on a set of tires, he'll hold off buying another set—until he has to."

Some tire companies, however, dispute the contention that car owners are not replacing or upgrading their tires. These companies say that since motorists are not buying new cars, they are being forced to buy new rubber or recap their present tires.

Nonetheless, some 475,000 tons of the nation's rated capacity is not even in use today for one reason or another—and even this has not caused any shortage of synthetic rubber.

Humble Oil & Refining Co.'s Baytown plant is shut down. Phillips Chemical Co.'s plant at Borger has been closed because of a strike. And the 110,000-ton expansion at Port Neches is not yet in operation.

The long haul . . . Statistics on synthetic-rubber demand contain the key to the plight of the butadiene industry in the U. S.

The estimated synthetic-rubber capacity in the nation today is 1,763,000 long tons per year. Not until 1965 is the domestic and export demand expected to reach that figure.

By 1960 the demand for U. S.-produced synthetic rubber should be only

1,280,000 tons—far short of today's capacity.

And even these demand figures may be high, particularly as they relate to the export market. Soviet Russia has announced its intention of exporting synthetic rubber in a big way, and a half a dozen other foreign countries are busy building up their own capacities.

In 1957 the export of S-type rubber, which uses butadiene, amounted to 158,017 long tons. The export market, by 1965, for S-type is optimistically placed at 250,000 long tons. But this figure may dwindle if foreign output of butadiene and synthetic rubber outstrips new demand.

Current S-type output . . . U. S. production of S-type synthetic rubber (formerly called GR-S and now referred to as SBR or S-type) amounted to 907,534 long tons in 1957, and this year it is expected to drop some 80,000 to 85,000 tons. But S-type capacity in the U. S. is around 1,250,000 tons.

Approximately 63% of all rubber consumed in the U. S. is synthetic, and S-type accounts for 83% of the synthetic consumed in the U. S. and 78% of that exported.

Prices . . . One limitation on future growth of the butadiene industry is being applied by the natural-rubber industry.

To halt further encroachment on its market by synthetics, natural-rubber importers have slashed their prices in recent years. This downward trend continued during the past year to the point where today prices of synthetic and natural are highly competitive.

Natural rubber is down some 15 cents per pound from its 1955-56 level. The cut during the past year has been some 6 or 7 cents.

Prices on natural rubber at New York now range from 18 to 25 cents, depending on the grade, while synthetic prices have remained stable over the past 6 years at about 19 to 24 cents, delivered.

The fact that synthetic still has some 63% of the total market is proof in itself that the product has improved dramatically in quality from what it was in the early days of World War II.

Future building . . . Because of the obvious overcapacity, no new dehydrogenation processing plants for butadiene are now being planned.

But a complicating factor affecting future expansion is that butadiene can be produced as a byproduct in ethylene cracking. Although this is a relatively minor source of butadiene, it still provides another source of new supply of a product which already is in oversupply.

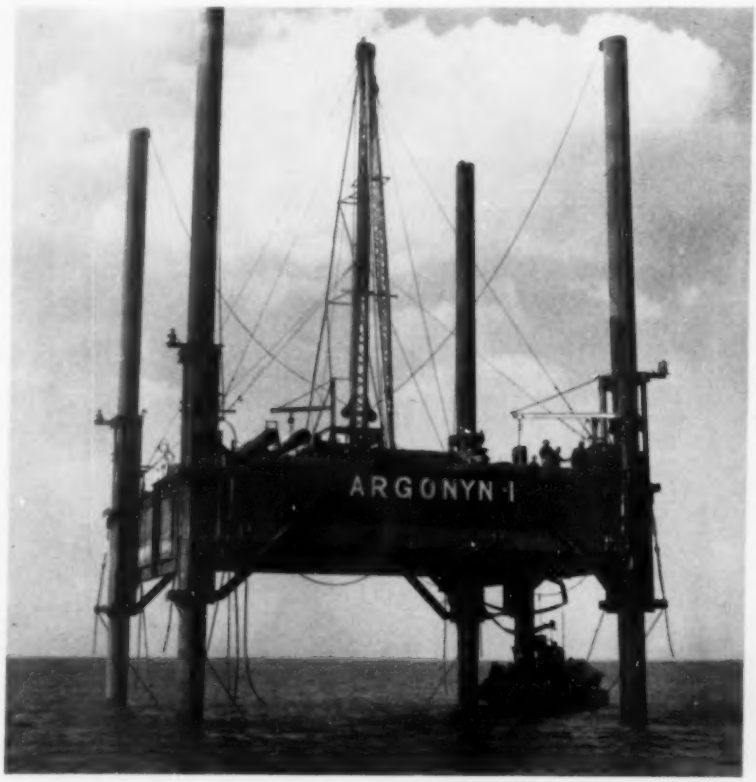
As a byproduct of ethylene, butadiene may be produced by purification facilities only, and this entails relatively less capital investment and lower operating costs than the more expensive dehydrogenation of other feed stocks.

Another possibly adverse factor, as far as butadiene is concerned, is that companies are experimenting with new processes for making synthetic rubber. Plants may be built to produce cis-polyisoprene (synthetic natural), using isoprene instead of butadiene.

Offsetting this, however, is the experimenting with cis-polybutadiene, which uses butadiene.

There is always the hope that a major new use can be found.

The factors affecting butadiene's future are many, but the industry today is agreed generally that overcapacity is so great that profits will be lean for a good many years to come.



Offshore Platform Goes to Work in Erie

NEW YORK State Natural Gas Corp. is drilling its first Lake Erie wildcat off the coast of Pennsylvania, and geologists say the company has a good chance of finding gas pay on the 35,710-acre concession.

The first test is being drilled 6 miles east of Conneaut, Ohio. It is scheduled to go below 5,280 ft. within the next 3 months. Then the platform will be moved from the 19,130-acre Block 1 near Conneaut, to the 16,580-acre Block 2 near the New York border. Both leases were acquired from the State of Pennsylvania last fall for an annual rental fee of more than $90,000.

The tubular-pipe legs of the 50-ft.-square platform were driven 5 in. into the solid-rock bottom of the lake, and the platform was raised by hydraulic jacks attached to each corner. The legs are 130 ft. long and 36 in. in diameter.

All the wells will be drilled within a few miles of shore. Geologists for the company expect to find gas in any of five formations: Oriskany, Lockport, Medina, Trenton, and Gatesburg. The Oriskany is found onshore at about 1,500 ft. in the area, and the Gatesburg at about 5,780 ft. (OGJ, Apr. 7, p. 116).

The wildcat is the first offshore well ever drilled on the U. S. side of the lake, although drilling on the Canadian side dates back to 1913 when gas was found 300 ft. offshore.

House to Vote on Imports

. . . in showdown on controls this week. A compromise offer by the administration may help rebuff mandatory quotas.

CHANCES that mandatory quotas on oil imports will be written into the foreign trade bill by the House appear to have been wiped out.

Prospects for approval of the new national security clause worked up by the ways and means committee (OGJ, May 26, p. 58) were greatly improved by developments last week.

The showdown will come this week when the House gets down to passing the measure.

The bill will be brought up under a rule allowing 8 hours for debate and the offer of a substitute measure — but no amendments — from the floor.

Round No. 1 . . . The first fight will rage around adoption of the rule by the House. If the rule is defeated, all time limits and restrictions on amendments will be scrapped.

But if the rule is adopted, the plan is to debate the measure for the allotted time and then for Rep. Richard M. Simpson (D-Pa.) to offer his substitute for vote.

The two moves that encouraged backers of the committee measure were the administration's offer to expand the standards for application of Section 7 and Simpson's agreement to put the whole security clause in his substitute bill.

What it means . . . The administration offer would require the mobilization director to consider the state of exploration and development in any study of whether imports threaten national security.

The addition of exploration and development to the list of factors to be considered would greatly strengthen the position of domestic producers, it was explained.

In fact, it was said, the addition could make the basic operations of the industry a major influence in the study of imports. Producers would be able to point not only to the loss in demand for domestic crude resulting from excessive imports, but also to the effect of imports on the backbone of the oil industry—leasing, geophysical and geological work, and development.

If these activities were shown to be depressed, there would be little room for a finding that imports were merely supplementing, not supplanting, domestic production.

APRIL IMPORTS WERE WITHIN QUOTA

Districts 1-4
(Thousands of barrels daily)

IMPORTERS:	Allocation April 1, '58	Actual April '58
Atlantic	53.5	41.3
Bay Refining	2.9	3.0
Cities Service	29.6	51.5
Clark Oil	2.0	
Crown Central	4.5	12.3
Dow Chemical*	0.3	
Eastern States	16.6	†32.4
Gabriel	6.8	
Gt. Northern	30.0	21.1
Gulf	101.3	101.3
Hess, Inc.	10.4	8.3
Intl. Refineries	11.2	4.8
Lakehead Pipeline	0.3	0.1
Lake Sup. Ref.	4.5	1.8
Northwestern Ref.	12.3	8.6
Phillips	10.9	8.6
Shell	6.8	20.2
Sinclair	56.5	51.8
Socony Mobil	60.9	59.9
Southwestern	2.6	
Stand. of Calif.	60.7	67.5
Ind. Standard	27.1	26.1
Jersey Standard	65.4	†67.0
Stand. of Ohio	7.4	5.8
Sun	45.8	57.2
Texas Asphalt	2.1	3.5
The Texas Co.	49.5	33.4
Tidewater	31.1	18.6
TOTALS	713.0	706.1

*Plans no further imports. †From Texas Railroad Commission.

The ways and means committee accepted the change, although Chairman Wilbur D. Mills (D-Ark.) said he didn't think it was necessary.

The clause originally written by the committee was broad enough to cover these activities, but it was all right if they were spelled out, Mills said.

The clause also was accepted, but reluctantly, by Rep. Frank Ikard (D-Tex.), who wrote the stiff quota provisions favored by the domestic producers.

Spokesmen for the mineral industries, who also had supported the Ikard plan, indicated that they, too, would go along.

Where it stands . . . As the House prepared to debate and vote on the bill, the situation was this:

Ikard's quota plan was lost in the maneuvering which led to agreement that the new Section 7 should be the focal point of the controversy over imports.

The bill brought out by the ways and means committee is acceptable to the administration. It calls for a 5-year extension of the Trade Act. And it would allow the President to make further cuts in import duties.

The bill does not meet the demands of the protectionist block, however. Particularly criticised are the peril-point and escape-clause provisions which, while tightened up somewhat, are declared not to go far enough.

Simpson's plan . . . The Simpson substitute would continue the law for only 2 years. There would be few further cuts in tariffs. And the peril-point and escape clauses would be made much more effective, its backers claim.

Simpson's substitute, however, is totally unacceptable to the administration. Officials have predicted freely a veto if Congress accepts it.

Voting procedure . . . The House will have four opportunities to vote on the bill.

The first will be on the rule to limit debate. The vote here could open the bill to all sorts of amendments, if the rule were rejected.

The second vote, if the rule is adopted, will come on the Simpson substitute.

The next move, however, will be the most important. It will be a motion to recommit the bill to the ways and means committee.

Members who dislike the committee bill, the Simpson substitute, or both, will vote to recommit. The Independent Petroleum Association of America is urging oil-state congressmen to back such action.

Recommittal of the measure could well mean its death and the need to draft an entirely new bill if the reciprocal trade policy is not to be abandoned.

If the rule is adopted and the motion to recommit defeated, the final vote will be on adoption of the committee bill or the Simpson bill, whichever the House has previously accepted.

Imports figures . . . Meanwhile, Capt. M. V. Carson, Jr., imports program administrator, released figures last week that show the nation's crude imports in April fell to 846,200 bbl. daily.

This was 86,900 bbl. daily less than the allocation of 933,100 bbl. under the two import programs, Carson pointed out.

Imports into Districts 1-4 dropped to 706,100 bbl. daily. That was 6,900 bbl. under the quota of 713,000 bbl. and 138,100 bbl. under March. Dis-

trict 5 imports were down to 140,100 bbl. daily. This brought them to 11,500 bbl. a day under March and 80,000 bbl. under the program total.

Company schedules of imports for the 5 months beginning with May total 711,200 bbl. daily for all five districts.

As an example of what is being accomplished under the program, Carson points out that August crude imports are scheduled at 677,400 bbl. daily in contrast with actual imports last August of 966,800 bbl. a day.

Compliance recognized . . . Carson reported that certificates of compliance covering the 3 months ended with April were issued to a number of companies which bid on government contracts this month.

The certificates, together with a promise to comply with the import program during the period of a contract, are required before importing companies can do business with either the civil or military branches of the Government.

Carson listed the certified companies as Standard Oil Co. of California, Socony Mobil Oil Co., Tidewater Oil Co., General Petroleum Corp., Sinclair Refining Co., Union Oil Co., International Refineries, Inc., Shell Oil Co., Richfield Oil Corp., Cities Service Co., The Texas Co., Crown Central Petroleum Corp., and Macmillan Petroleum Corp.

Wage Raise Granted

at Whiting in pact signed by Indiana Standard, union.

A WAGE agreement calling for a pay increase was signed last week by representatives of Standard Oil Co. (Ind.) and Independent Petroleum Workers of America Local No. 1.

The wage increases ranged from 4.5 cents to 7 cents an hour at the company's Whiting, Ind., refinery.

Indiana Standard announced the adjustments were offered following an area refinery job-rate study it made which showed variances in its pay scales from those of competitors. The agreement called for retroactive pay for IPWA-represented employes to March 9.

The new contract runs until March 8, 1959, and provides for one wage reopener during that period on 30 days' prior notice.

In another oil-industry labor development, Union Oil Co. of California and the Independent Union of Petroleum Workers, Inc., signed a contract effective June 1. Wages were not involved.

watching WASHINGTON

. . . with Bertram F. Linz

• Future tankers may sprout wings

MARINE ENGINEERS are outdoing Buck Rogers in drawing the ships of the future.

They already have passed the stage of the submarine tanker and are talking of ships that skim along on the surface of the waves or even "fly" above them.

Whatever its form, the tanker of 1975 will really be a high-speed job. Under water, it may hit 60 knots. On the surface, it may make 80, with less power than is needed today to get half that speed.

Nuclear power will make for long-distance movement without refueling. And, eventually, submarine tankers may go halfway round the world under remote control, without a crew.

These things aren't just from dreamland. They are what the naval experts are working on right now.

The Maritime Commission has been studying the nuclear tanker for some time. Now it has turned its attention to the use of hydrofoils or "sea wings" on surface vessels. They would enable a ship to skim along like a speedboat.

British engineers are going still further. They are working on a ship that actually would be a "flying" boat. It would be as heavy as a freighter and as fast as a small airplane. A set of jets would produce a cushion of air between the ship and the water. A second set would propel it forward.

• Government needs more businessmen

A "FRIGHTENING LACK of interest in the business community for participation in the government service" is pictured in a survey by the Harvard Business School Club of Washington.

But there is lack of interest in Government, too, in making service attractive to businessmen, it is indicated.

The Eisenhower administration has been called a "businessman's government," the study commented. But it has had a very hard time getting the kind of businessmen it wanted.

The Government needs more rather than fewer businessmen in important posts, the survey report concludes.

"The new competition with Soviet Russia is more likely to be won in the bureaucracy of Washington than on some battlefield," the survey warns.

"Despite this, the Government does not at present take continuing action to recruit and retain businessmen or any other type of executive manpower."

• Oil's research program is growing

OIL INDUSTRY INTEREST in research and development has been growing steadily since the end of the Korean war.

It is now spending more than a quarter-billion dollars yearly in the search for better products and better methods of production and refining.

The industry hit the $250.3-million mark in 1956. Its spending in that year was 71.6% more than the $145.9 million used for research in 1953, a study by the National Science Foundation shows.

The NSF figures cover only the research on production and processing. They include no estimate for research on field exploration.

The federal Government, meanwhile, has cut back on its research on oil. It spent $8.2 million in that field in 1953 but only $5.1 million in 1956, although its total research fund increased by 13% in that period.

How Far Should Gas Regulation Go?

Oil, gas, and product lines have the same problems. Should all of them be controlled by the same agency? William R. Connole, of the Federal Power Commission, thinks perhaps they should.

Connole, in this exclusive interview with the Journal, also sees a critical threat to the U. S. gas industry ahead in imported methane. And he says there are some serious problems to be met in imports of gas from Canada.

Editor's Note: William R. Connole is the youngest and most controversial member of the five-man Federal Power Commission. During his 3 years on the commission, he has been widely criticized by the petroleum industry for his views on federal controls. He will probably be around in Washington for many years to come.

For these reasons, the Journal thinks gas men should know him better. To give gas men Connole's philosophy in his own words, the Journal assigned its veteran Washington editor, Bertram F. Linz, to conduct this extensive interview.

Q. Mr. Commissioner, is the Federal Power Commission the only agency with control over pipelines?

A. At the present time regulation of the pipeline industry, both oil and gas, is spread among the several agencies of Government on both the federal and state level.

For example, on the federal level, some degree of regulation at least is exercised by the Interior and Defense departments, Interstate Commerce Commission, Federal Power Commission, and perhaps some others.

This appears unduly burdensome to the industry and probably does not react in the general public interest. I suggest that more reasonable and effective regulation is possible were oil pipelines and natural-gas pipelines and even liquefied petroleum gas pipelines regulated by the same source.

Q. Would that involve control of the oil and LPG lines?

A. This doesn't mean that I favor the regulation of oil pipelines to the same extent and in the same manner as natural-gas pipelines.

The nature of the business as a common carrier in law, if not in fact, argues against this.

Nor do I advocate divorcement of pipelines from integrated companies. Every effort to date to do so has met with such objections that it has failed. But there are enough problems common to both that regulation of one should not be carried on with no regard whatsoever for the direction of the other.

Q. You feel then, that oil and gas pipelines are so similar in some respects that they should be dealt with by a single agency?

A. As natural-gas pipelines increasingly resort to transportation contracts covering gas to which they do not have title, they become more nearly like oil pipelines with the exception, of course, that the duration and stability of the transportation contracts differ.

Similarly, oil pipelines, to the extent they are successful in maintaining their status as plant facilities of integrated companies, become more nearly like natural-gas pipelines that produce from their own reserves and transport to a buyer.

I think the whole petroleum-energy picture should be before the regulatory agency which attempts to regulate any one aspect of it.

Q. Getting down to the case of gas, what changes do you feel should be made in the Natural Gas Act?

A. First, the requirement that certificates of public

Connole Outlines His Philosophy on Regulation

"I believe strongly in two fundamental principles. These govern my actions as much as any other.

"First, the regulatory process is the soundest protection against either of two unacceptable extremes; the unbridled monopolistic excesses which, in the early history of the nation, nearly wrecked industries affected with the public interest, or outright socialism of those industries. It would be hard to select which is worse.

"Secondly, the regulator constantly must choose between two or more unpopular choices, any one of which will offend some vested interest or misguided consumer interest.

"The knowledge of the first is what gives regulation its validity and its challenge. It is the reason that regulatory commissions, in my judgment, are in the very front rank in importance among domestic governmental agencies.

"The knowledge of the second is what makes it possible to shrug off any mistaken objections to decisions I may join in and is the reason I feel no personal offense at them.

"I believe the industries under regulation will thrive, and the economy of the nation with them, to the extent that regulation is sound, is respected, is observed. For this reason I resent deeply the suggestion that the remedy for any individual infirmities discovered in isolated instances is to abolish the whole system. Such burning down of the barn to roast the pig would be catastrophic. After all, the electric and gas industries, to name only two, represent the greatest aggregations of capital ever known to the world. And they have prospered because of, not in spite of, effective regulation.

"The risk to our entire economic and political structure of discarding that process now is unthinkable."

convenience and necessity be obtained before producers may sell gas should be dropped.

No material benefit seems to result from this requirement. Only one real benefit can be realized from this process and this can be achieved in other, less burdensome ways.

New contracts for sale of gas should be presented to the commission before sales are permitted under them to give the commission an opportunity of deciding whether the public convenience requires the commencement of sales at the particular price level proposed.

Q. How can this be done?

A. This can be done through some modification of the requirements of Section 7 of the Natural Gas Act, and in my judgment would provide the most effective and painless method of keeping natural-gas prices from running away with the market.

Q. How does this "running away" come about?

A. It is the new contracts which historically set the level for future negotiation and for price increases in existing contracts.

For example, in a recent hearing on a producer's contract a responsible official for one of the largest purchasing pipelines testified that the highest price being paid for gas in the same area is determinative of the price asked for the gas. By restricting these increases the artificial pressure for pipeline companies and others to bid unreasonably high prices is sharply reduced. Meanwhile, price levels are subject to an orderly demonstration of their reasonableness in appropriate proceedings.

The point is that the pressure for new prices then will come at price levels established by commission authority and after commission review. It will not be the result of near-panic or overeager buying on the part of one or more pipelines which find themselves in a temporary shortage of gas and must go out and pay virtually any price in order to correct it.

Q. What about standards of reasonableness?

A. If the standard of measuring the risk and, hence, the lawful compensation to a producer, is as hidebound as the literal interpretation in the city of Detroit case would hold, there is much need for flexibility.

I suggest that the measure of the risk is more particularly a function of exploration and development cost than of invested capital or operating expenses in the sense more commonly used in the regulatory field.

This is because the gas production business will succeed or fall depending on whether the market will support development and exploration. Consequently, moneys spent in that pursuit are the moneys we should watch most closely and ratio to revenues in order to develop a fair incentive and a just return.

Furthermore, whether rates will provide enough to meet the financial needs of the industry (whatever rate-making unit is finally used) and will compensate for the risk in further exploration and development depends on the probabilities of future markets. This means concern for price and marketability of competitive fuels.

For this reason, I believe some consideration must be given to the impact of the producer price at the end of the line, particularly how that price will square with competing fuel prices.

Q. Do you see price as a cause for alarm in the industry?

A. Prices have been bid up by over-eager pipelines seeking more and more gas without sufficient regard for the impact of the new prices and the end product.

The experience in South Louisiana provides a striking example. The average price for deliveries made under 20-year contracts entered into in 1954 was 10.1

WILLIAM R. CONNOLE is the youngest man ever appointed to a federal regulatory agency. He became a member of the Federal Power Commission in June 1955 at the age of 33.

But he had established another record 5 years earlier. He was the youngest person ever to be appointed general counsel to a state regulatory body when he joined the Connecticut Public Utilities Commission. He advanced from that post to the FPC.

Connole was born in Naugatuck, Conn., in 1922. He has three degrees, a Bachelor of Arts from Georgetown University's school of foreign service and college of arts and science, and a law degree and Master of Arts in economics from the graduate school of Trinity College, Hartford, Conn.

Connole got his first experience in regulation in the Interstate Commerce Commission. Joining the ICC while in law school, he served first as legal assistant to Commissioner Walter M. W. Splawn and later as attorney-examiner in the Bureau of Formal Cases. After leaving the ICC, he engaged in the general practice of law.

While on the FPC, Connole frequently has dissented from the majority. He has refused to attach conditions to producers' initial prices which he felt were too high and in cases where he felt the result was out of line with his concept of regulation (see p. 71). He also has opposed congressional recommendations that FPC not be required to consider cost and revenue in rate cases.

Connole is married and has four children.

cents while in 1956 it was 16.9 cents. This represents a more than 66% increase in 2 years.

Q. Do you feel that is serious?

A. Yes. This is serious for two reasons.

First, the effect of increased producer prices is a kind of time bomb which doesn't explode until many years after the contract was made, by which time the average cost of purchased gas for a particular company may be too high to permit it to retain an effective load factor. But because of the contract terms it will be impossible for the pipeline to do anything about it.

Secondly, and related to the first reason, the ratio of wellhead prices to average value at point of consumption remains remarkably constant. For example, the average wellhead price was 25.3% of the value at point of consumption for the 10 years 1946 through 1956 on the average. This is so despite an increase in wellhead price from 6.2 cents (the 1946 to 1950 average) to 10.8 cents (the 1956 price).

Q. What does that indicate to you?

A. If the average wellhead price continues to increase, and the relationship between that wellhead price and value at point of consumption remains the same, the average wellhead price by 1962 will be 17 cents and the average value at point of consumption will be 60 cents. As the more recent contracts occupy an increasingly large proportion of total sales, the rate of increase might well be greater.

Sometimes it appears that the separation of producer from ultimate consumer has served to dull the realization of how steeply and rapidly the prices at point of consumption can be expected to increase in the next few years. And with off-peak sales already being lost to competing fuels and no clear-cut successful substitute to take up those sales, the prospects are that the slack will appear in the rates for winter heating season customers.

Q. Do you consider all producer prices too high?

A. No. Despite the increase in average wellhead prices, there is an unjustifiable number of producer prices which are unrealistically low.

This comes about by virtue of the pressure on the pipelines to purchase gas at prices which will permit them to keep large trunklines with large compressor capacity operating at a practical load factor during the off-peak season. No consideration is given, however, to whether this gas will be purchased for sale at premium prices or for sale at dump prices. The price the producer gets in the same.

Q. Have you any suggestion to meet this situation?

A. I wonder whether the producer segment of the industry should not consider asking lower rates for gas sold to fill valleys than for gas that is sold to meet peaks. When the pipeline can obtain the highest price for its gas should it not pay more for it to the producer, and when it gets least for its gas should it not pay less?

Q. Wouldn't that be rather complicated?

A. I appreciate the complications when a line is purchasing for storage or is selling to a distributor who may have a summer instead of a winter peak. Moreover the pipeline does not tag individual M.c.f.'s for off-peak or on-peak use. Nevertheless, I think some consideration might be given to instituting a two-part rate which would recognize that the producer as well as the pipeline and distributor is rendering part of the service of meeting a fluctuating demand.

Q. Would this help the producer?

A. This suggestion could actually increase a producer's revenue because he will get more for the most valuable M.c.f.'s. At the same time it would reduce the total costs of delivered gas to the ultimate consumer.

Most costs that are added to the wellhead price to reach the price at which the gas is sold to consumers are capital costs. And more of these capital costs are levied on the peak consumers because of the need to allocate as few as possible to the very price-sensitive customers to whom gas is sold at off-peak times.

Q. How about the effect on consumers?

A. If a smaller proportion of the off-peak price consisted of costs to the producer, a larger proportion of constant costs could be allocated to these large volumes, thereby reducing the contribution necessary from ultimate consumers at the peak period.

Q. Wouldn't this unfairly improve the position of gas in competition with coal or oil?

A. No. No unfair competitive advantage would accrue to gas, unless the price were permitted to fall to levels so low that they would defeat the purpose of the two-part rate. The increase in volume as a result of the reduction in the on-peak price would undoubtedly stimulate increased use of gas for superior purposes to the ultimate advantage of producer, pipeline and consumer.

And because pipelines no longer would have to keep prices artificially low to be able to sell at off-peak times, prices to the producer no longer would be set by the least valuable of unit sales made by the pipeline.

Q. Mr. Commissioner, where is the natural-gas business going?

A. The needs for energy continue to climb at spectacular rates. The differences between experts who have assessed the situation is only how far up they will go. Few have been pessimistic enough to assume even a declining rate of increase. None has suggested they will stop climbing altogether.

But, first, there must be an optimum pipeline capacity for each stage of energy demands. Every pipeline is not rendered economically feasible simply because some people state that they want to buy natural gas. And, secondly, we must realize that there is a fixed and definite volume of hydrocarbon resources.

Q. What does that add up to?

A. From these considerations, two facts appear. First, the ultimate level at which pipeline capacity will stabilize is the level at which competing fuels, operating in an unregulated market (including both coal and other petroleum products) will adjust themselves.

There is a possible price for every product where it will "maximize" the profits to a seller. Once this level is reached for competing fuels it will work its way back to natural-gas prices and set the practical limit for them as well. If a new line cannot be built, or new capacity added that will bring natural gas in at a price competitive with those competing fuels, it will not be built.

Q. And the second fact?

A. The second fact is that the limits of the hydrocarbon energy resources available to this nation may be widened vastly by the use of liquefied methane from the Middle East or elsewhere.

Q. Do you attach any importance to that?

A. I do indeed. This could be the most revolutionary development in the next 10 years, considering the almost unmeasured natural-gas wealth which now awaits economic development in the Middle East and Venezuela, to mention only two sources.

Unrestricted imports could wreck the price structure of the natural-gas industry, and indeed the entire fuels industry—coal and oil—as we know it.

I suggest that the problems of the petroleum industry in handling its oil-import dilemma will be minor compared to the problem which will beset the coal, oil, and natural-gas industries once liquefied methane by tanker becomes a reality.

Q. Where will the FPC fit in?

A. The same considerations that will govern the decision on importing Canadian gas also will affect the decision of the U. S. whether to authorize the importation of natural gas from other producing areas in the form of liquefied methane.

The technical roadblocks to the practical importation of natural gas in this way are close to solution. Soon we will be faced with the question whether and how this importation should be permitted or regulated. Even intracoastal transportation of natural gas is a distinct possibility.

Q. Does the law not cover this matter?

A. I do not know whether the Natural Gas Act plainly contemplates such transportation and whether a carrier by barge or tanker would be a natural-gas company within the meaning of the act. Of even greater interest is the issue whether an importer, say from the Middle East, is a natural-gas company.

But I think the problem is near enough that some efforts should be made now before the problem bursts upon the industry and the regulatory community and finds both without any practical solution.

Q. You mentioned Canadian gas. What is involved there?

A. In my opinion, the first decision to be made before the introduction of Canadian gas is to determine whether its use in the U. S. is in the interest of either country.

That means we must know how much it will cost the U. S. to import natural gas. That means more than mere cents per M.c.f. There are several considerations of national and international policy over and above the considerations of the cents per M.c.f. it would cost.

Against this price, for instance, must be weighed the advantages of having an additional supply. On the other hand, Canada must weigh the pros and cons to its economy. If it is apparent that the mutual best interest of both nations would be served, the way is clear to examine the other factors involved in specific applications for authority to import.

Q. Is this a matter for the FPC to decide alone?

A. It seems to me that many of these considerations may not be proper subjects for FPC consideration. Some affect the relations of this nation with Canada, while others affect our national defense or the internal economy of the nation to the extent other and competing fuels are involved.

Issues affecting our relations with Canada are perhaps the most delicate. And it is in this area an administrative regulatory agency is least qualified.

Q. Where, then, should the problem go?

A. The President, under the Constitution, has charge of our relations with foreign powers. The import

and export of a natural resource as valuable as natural gas affect these relations with Canada in matters of broadest public and international import.

Our relations with Canada quite properly are within the specialized responsibility of the President and the executive Department of State. How they will be affected by the terms of an order authorizing the importation of natural gas can hardly be evaluated by the FPC with any degree of accuracy.

Accordingly, I have some doubt whether the FPC, an arm of the Congress, is the proper repository under the Constitution for the power to grant or withhold import authority and permission to construct facilities at the border for importing natural gas.

Q. But the FPC does have some authority, doesn't it?

A. I appreciate the FPC is supposed to be concerned with the problem as a matter of economic public policy rather than primarily as one of international policy.

I also appreciate that before a "Presidential Permit" to construct facilities at the border will issue consultation with the State Department is necessary.

Q. That seems to be pretty clear-cut, doesn't it?

A. Nevertheless, I do question the vesting in an administrative agency in the first instance, and as the ultimate authority, of power to issue orders directly affecting our relations with a foreign power.

I am especially concerned when the standards in this delegation are so vague.

Q. In what way are they vague?

A. For example, the Natural Gas Act says only that we shall issue an order permitting importation unless we find it "will not be consistent with the public interest."

At least the Federal Power Act adds a limitation. It prohibits the issuance of an order authorizing the export of electric energy if the commission finds "the proposed transmission would impair the sufficiency of electric supply within the U. S. or would impede or tend to impede the coordination in the public interest of facilities subject to the jurisdiction of the commission."

Just where the public interest lies with which we must reconcile each request for import authority for natural gas is far from obvious.

Q. Are any other factors involved?

A. Yes. In addition all sorts of conflicts within the internal fuels and energy policies of this nation are involved. The oil-import problem is evidence of this.

Of course, these problems are more properly the subject for FPC concern. But even these are inextricably bound up with questions of national fuels policy beyond our responsibility because the interests of so many other fuels and factors in the economy are involved.

For example, questions of tariffs and excise taxes, and the extent to which it is in the best interest of this nation to encourage world trade or to protect domestic industries, come to mind.

And, of course, there has never been any clear expression of a national energy policy by this nation. The President's Commission on Energy Resources has taken long and constructive steps in this direction but much still remains. And in Canada far-reaching efforts are now being made in this direction by the Royal Commission on Energy.

Q. What course, then, would you suggest?

A. In my judgment, the first step is for both the United States and Canada to establish firmly where the best interest of each nation lies. In other words, to establish what is "the public interest" with which the importation of natural gas must be consistent before it may be authorized.

Q. What would this "public interest" involve?

A. This must consider adequately how best to serve the whole of our national economy, not just one segment of it like natural gas. It means the welfare of the consumers of all forms of energy must be considered. It means that proper attention must be given to what will happen to the petroleum industry, the railroad industry, the coal industry—indeed to all sections of the economy that will be affected by whatever decisions are made to emphasize one fuel or another.

And in addition, the effect on our foreign relations will have to be weighed.

The issuance of presidential permits and import orders by the FPC will have much firmer basis once these principles are visible. At that time more meaningful consideration can be given to specific requests for authority to import natural gas from Canada.

Q. How would those decisions affect the work of the FPC?

A. I think a decision as important as whether to authorize large-scale importation of natural gas from Canada, for example, should be jointly reached in cooperation with the exporting nation. I think the terms should be agreed upon beforehand. Perhaps more important, a means must be set up to insure they are carefully observed and not changed unilaterally during the life of the contracts because conditions change on one side of the border or the other.

Q. How can this be done?

A. If proper determination is had on what is in the best interest of each nation and if the authority to import from Canada is made after such joint determination the job is half done.

It will be completed if joint authority is created to effectuate these agreements or if the respective regulatory authorities on both sides of the border agree on the principles and the procedures to use when viewing the regulation of the importation and exportation of natural gas.

Q. And in the meantime?

A. Of course, when we are confronted with actual applications at present we must act as best we can, relying on expressions of domestic policy to the extent that they exist. Similarly, we must rely on ad hoc decisions on the international level.

This is vastly better than to refuse to consider them at all. Moreover, until some authority, such as a court of law having jurisdiction, tells me otherwise, I have no choice but to carry out the law as now written. **End.**

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Texaco Takes Over Seaboard Oil in Big

ONE of the oil industry's biggest deals in history will be closed this week when The Texas Co. swaps roughly $241,500,000 worth of its stock for all the assets of Seaboard Oil Co. and its subsidiaries.

Taking control of the Seaboard oil properties will be Texaco Seaboard, Inc., a new wholly owned subsidiary of The Texas Co.

Assurance that the deal would go through came late last month when Seaboard stockholders, holding more than 99% of the votable stock, voted favorably in a brisk matter-of-fact meeting in Dallas.

Final closing is scheduled June 2 in Chicago at the offices of the Continental Illinois National Bank & Trust Co. of Chicago.

Immediately following the closing, Texaco will distribute 3,660,159 shares of its stock, valued at present market prices at about $66 per share, to Seaboard shareholders on a share-for-share basis. Seaboard will then be dissolved.

The Texaco stock involved in the Seaboard deal represents about 4% of the company's total outstanding. Texaco already owned 33% of Seaboard's stock. The current deal gives it the other 67%.

Russell S. McFarland
. . . Seaboard president bows out.

J. Howard Rambin, Jr.
. . . heads new Texaco subsidiary.

Giant growing . . . The Seaboard properties will swell the already huge Texaco oil holdings.

The company's net properties, plant, and equipment totaled $1,590,085,000 the first of the year—with 72% of the total in the U.S., 26% in other Western Hemisphere countries, and 2% in the Eastern Hemisphere.

On top of this are interests in other companies, among them Arabian American Oil Co. (30% owned) and the Caltex group of companies (50%).

Last year, Texaco grossed $2,449,162,410 and came out with a net profit of $332,303,644 after taxes. These figures include dividends paid to Texaco by nonsubsidiary companies (owned 50% or less).

Texaco's net crude oil and gas liquids reserves the first of the year totaled 3,390,000,000 bbl. This included 1,797,000,000 bbl. in the U.S., 404,000,000 bbl. in Canada, 569,000,000 elsewhere in this hemisphere, and 777,000,000 bbl. in the Middle East.

Equity in nonsubsidiary companies swells the company's net crude-liquids reserves to a huge 15,032,000,000 bbl. Net equity reserves totaled 11,642,000,000 bbl. December 31, 1957.

The great bulk of the Texaco equity oil reserve in nonsubsidiary companies comes from its Aramco and other interests in the Middle East. This reserve had reached 10,525,000,000 bbl.

The remaining equity reserve includes 1,001,000,000 net barrels in the Far East (principally Sumatra), 61,000,000 bbl. in the U.S., 7,000,000 bbl. in Canada, and 48,000,000 bbl. elsewhere in the Western Hemisphere.

Production and acreage . . . Last year, Texaco produced a net 194,809,000 bbl. of oil—of this, 130,543,000 came from the U.S. and lesser amounts from Canada, the Middle East, and other Western Hemisphere countries. Its equity production from nonsubsidiary firms added 155,095,000 bbl. to bring the total to 349,904,000 bbl. Of the equity production, 114,482,000 bbl. came from the Middle East.

The company owns 20,347 net wells

Here's What Texaco Is Getting from Seaboard

U. S. production of crude and condensate which last year totaled 12,501,000 bbl. in Arkansas, California, Louisiana, New Mexico, Oklahoma, Texas, and Wyoming.

Canadian production of about 2,280,000 bbl. of crude and condensate annually in Alberta.

Net oil reserves totaling 195,493,000 bbl. This includes 160,732,000 bbl. in the U. S., 23,761,000 in Canada, and 11,000,000 bbl. in Venezuela.

Natural-gas production which topped 37 billion cubic feet in U. S. last year.

Net gas reserves estimated at 913.4 billion cubic feet, including 888.2 billion in the U. S. and 25.2 billion in Canada.

Plant products of more than 1,000,000 bbl. annually in U. S. This comes from undivided interests in 14 natural-gasoline plants.

Net plant liquids reserves of 30,200,000 bbl. in the U. S.

Net acreage of 3,371,235 in leases, permits, and fee lands in the U. S. and Canada. Proved acreage totals 120,933, and unproved, 3,250,302.

Venezuela concessions, including a 10% interest in 52,000 acres in Lake Maracaibo with seven prolific wells and several proved locations. Elsewhere in Venezuela, Seaboard holds 41,000 net acres, including 17,000 in the Pedernales area, where a discovery was completed last year.

Turkish concessions in which Seaboard has one-third interest in more than 3,000,000 acres. First test well is under way.

A working organization which last year grossed $52,781,918 and netted $11,158,842 after taxes. Both figures are all-time highs.

Stock Swap

—18,495 in the U. S., only 7 in the Middle East. Its nonsubsidiary interests add another 1,147 net wells, with 146 of these in the Middle East.

Texaco has approximately 3,608,000 net productive acres throughout the world including both its own acreage and its equity interest in nonsubsidiaries.

Refining and transportation . . . It operates 21 refineries in the Western Hemisphere, 13 of them in the U.S., with a crude charge capacity of 843,000 bbl. daily. Its equity interest in 17 plants owned by nonsubsidiaries all over the world is roughly 310,000 bbl. daily to hike the total to 1,153,000 bbl. daily.

The huge firm's refinery runs last year totalled 388,213,000 bbl. This included 282,764,000 bbl. from its own refineries and 105,449,000 bbl. from its equity in others.

Domestic crude and products pipelines (including undivided interests) stood at year's end at 6,653 miles which during 1957 delivered 285,755,000 bbl. of crude oil and 57,974,000 bbl. of products.

The company had varying interests through stock ownership in an added 7,067 miles of crude and 6,919 miles of products lines in the U.S. It also has interests in several foreign systems including the huge Aramco gathering system and Tapline.

It owns 46 tankers aggregating 730,300 dwt., operates 28 more under long-term charter aggregating 569,700 dwt., and is building 16 totaling 619,000 dwt.

The Caltex group (50% owned) operates a 122-tanker fleet totaling 2,200,000 dwt. The group owns 54 of these aggregating 897,000 dwt.

Texaco is a large manufacturer of petrochemicals. It has assorted interests in other petrochemical companies and in mining and other industries. It boasts a huge research plant which last year employed 1,650 persons and spent about $18,000,000.

Good for both . . . Texaco and Seaboard, their officials feel, will find the deal mutually beneficial.

Despite record earnings last year, directors of Seaboard had become increasingly concerned about the company's position.

The directors, according to Russell S. McFarland, Seaboard president, view with alarm a situation where "the search for new oil and gas reserves in the U.S. has become increasingly difficult and the costs of bringing reserves into production have been mounting rapidly.

"While the company has engaged in operations outside of North America to a limited extent, the magnitude of the capital commitments involved has restricted these activities. And, for the most part, the company's foreign ventures have been conducted in association with larger oil companies —often as only a relatively small participant.

"Because of these facts it does not appear probable that the company's position can be improved unless substantial additional capital is provided."

The deal with Texaco, McFarland told Seaboard stockholders, would give the stockholders an investment in a company that has the necessary capital to do things on a big scale.

Texaco stands to benefit, in turn, because it needs the Seaboard domestic reserves and organization. The big company is reportedly hurting for domestic oil under current low allowables in this country, as evidenced by its nomination for 12 producing days at the last Texas allowable hearing when only an 8-day pattern was adopted.

The new company . . . Heading up Texaco Seaboard, Inc., as president will be J. Howard Rambin, Jr., senior vice president in charge of The Texas Co.'s world-wide producing interests and activities.

A. W. Baucum, vice president in charge of the domestic producing department of Texaco, and J. N. Troxell, general manager of the domestic producing department, will be vice presidents. Further management arrangements are uncertain.

The Seaboard agreement provided that all officers and employes of Seaboard would be offered employment either with Texaco or Texaco Seaboard.

It is considered unlikely that McFarland, however, will accept such an offer. The well-liked oil veteran will reach retirement age in August and has indicated that he probably will take advantage of it.

U. S. Steps Up Jabs at Oil

. . . on several fronts. Pricing indictments expected from grand jury. Consent-decree court decision challenged.

JUSTICE Department pressure on the oil industry is intensifying.

An 18-month, grand jury investigation of industry pricing will wind up in Alexandria, Va., this week following questioning of top officers of some 15 companies.

Observers expect that one or more indictments may be handed down. The jury's major interest has been the January 1957 rise in crude prices. But its studies carried it also into the field of pricing generally.

Last week the Government challenged the decisions of the District of Columbia federal court throwing out its "Elkins Act cases" against three pipelines.

The suits charged violation of the 1941 consent decree's 7% limit on dividends by pipelines to their shipper-owners. They named Arapahoe Pipe Line Co., Service Pipe Line Co., and Tidal Pipe Line Co. (OGJ, Mar. 31, p. 55).

The department's challenge was carried to both the D. C. Appeals Court and the U. S. Supreme Court. Officials explained that the dual appeal was made because of uncertainty as to where it properly lies.

Other action . . . If the department gets a true bill in Alexandria, it will add to the already broad program of oil and gas cases it has scheduled for this year.

Three natural-gas pipelines and their top officers are under indictment in Milwaukee. The companies—American Natural Gas, Northern Natural Gas, and Peoples Gas Light & Coke—are charged with conspiring to prevent the import of Canadian gas by Midwestern Gas Transmission Co. (OGJ, May 5, p. 79).

Asst. Atty. Gen. Victor R. Hansen also has revealed his intention to bring both the cartel suit in New York and the monopoly suit on the West Coast to trial this year. The latter may be moved to San Diego at a cost of about $60,000, he said.

Hansen declared that the two cases are considered highly important by the department.

The Government's suit to dissolve the El Paso Natural Gas-Pacific Northwest Pipeline merger also will be pressed, the head of the antitrust division said. The merger, it is charged, threatens to result in a gas monopoly west of the Rocky Mountains (OGJ, July 29, 1957, p. 112).

This case, Hansen also explained, may serve to set the jurisdictional line between the Federal Power Commission and the Justice Department.

Texaco Extends Castle River

ANOTHER prolific link, which also produces from a promising new pay, has been added to Alberta's fast-growing Waterton Park-Castle River gas field—an area now being boomed as Canada's biggest gas reserve.

The field is part of the Foothills Belt in Alberta's extreme southwest corner.

The new well is Texaco Exploration Co.'s B6-17 Castle River, 3 miles northwest of Texaco's Castle River discovery well and 17 miles northwest of Shell Oil Co.'s 2 Waterton Park—southeastern limit of the big structure.

The B6-17 flowed 14,000 M.c.f. of gas per day from Devonian D-1 pay, topped at 12,985 ft. The well also is an indicated producer from the Mississippian, the established pay in the field.

Texaco reported a pay thickness of 513 ft. of Devonian D-1. The well is the second in the Foothills Belt to find Devonian production. The other is at Shell Oil Co.'s recent Panther River strike far to the north. All other production along the belt is from the Mississippian except at Mountain Park-Triassic field.

There were reported Devonian shows in Shell's 1 Waterton Park discovery well and at Texaco's Gladstone Creek, but they never were tested.

Drilling deal . . . Texaco's well lies on Drilling Reservation No. 141, bought from the Province of Alberta in May 1956, for a $68,288 cash bonus.

The reservation contains 11,396 acres, of which Texaco can select 14 quarter sections under Petroleum and Natural Gas Lease in return for drilling the well. However, the company has applied for a gas license on the remainder of the lands in the reservation, and if the license is granted Texaco can select an additional 10 sections by drilling another well below 6,000 ft.

Full importance of the Texaco strike will not be felt for some time — possibly not until legislation is passed setting a gas export policy. However, the area around Waterton Park-Castle River is covered in one firm's application for export rights, and Texaco and Shell are continuing their search for gas in the region.

Total reserves . . . C. H. Keplinger, Tulsa consultant, recently estimated reserves under Shell's acreage at Waterton Park alone at 448 billion cubic feet proved and 870 billion probable. Weighting the probable gas reserve, the estimate is 883 billion cubic feet under Shell's acreage.

Total reserves for the entire area—17 miles from southeast to northwest —would probably be between 2 and 3 trillion cubic feet. This is more than any other Canadian field, including nearby Pincher Creek.

The Keplinger report figured 16 sections of Shell's land at Waterton as proven and 31 sections as probable.

Based on the Shell weils, reservoir factors reported by Keplinger include the following: Porosity, 5.5%; average net pay, 160 ft.; recoverable gas per section, 50.9 billion cubic feet; shrinkage, 45%; and net gas for market per section, 28 million cubic feet.

Alberta Demand Up

slightly in June. Shell bid boosts U. S. nominations.

DEMAND for Alberta crude oil will pick up in June, after dropping to its lowest ebb in 3 years in May.

June nominations submitted to the Alberta Oil and Gas Conservation Board total 275,266 bbl daily. This is an increase of 8,761 bbl. daily over May nominations.

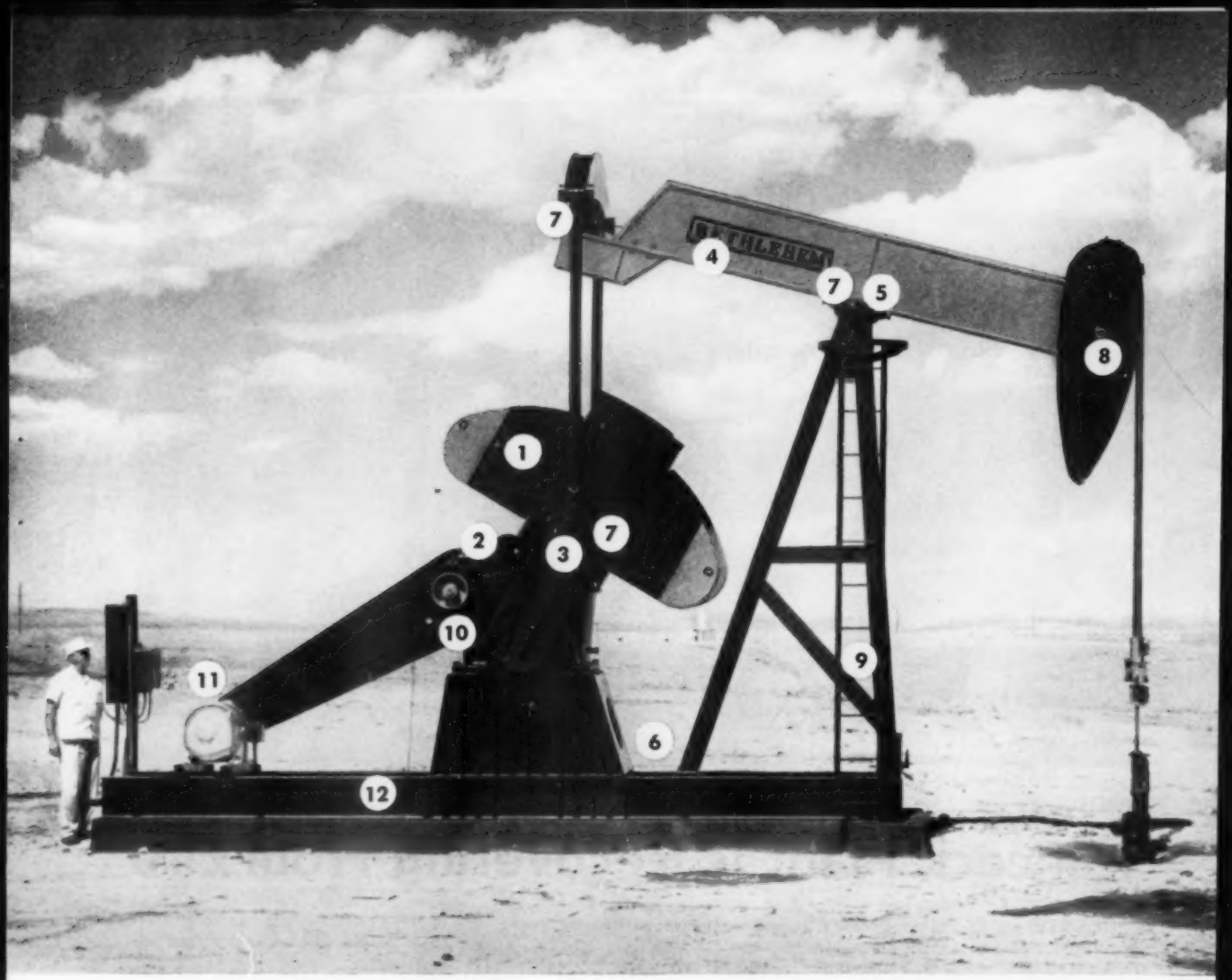
Requests from U. S. refiners jumped from 28,200 bbl. in May to 44,500 bbl. in June. Most of the increase comes from Shell Oil Co.'s Anacortes, Wash., plant, which will take 20,000 bbl. daily this month, compared with only 9,800 bbl. in May.

Practically all Canadian provinces will be taking more crude this month. Alberta refiners will use 62,310 bbl. daily. Saskatchewan, Manitoba, and Ontario, served by the Interprovincial pipeline, will take 131,407 bbl. per day.

However, Canada's west-coast demand has dropped to 36,399 bbl. daily. This will be carried through the Trans Mountain line.

Top nomination was again made by Imperial Oil, Ltd., seeking 92,450 bbl. daily. British American Oil Co., Ltd., asked for 47,710 bbl., and Shell Oil Co. of Canada, Ltd., will take 30,000 bbl.

In addition to Shell's Anacortes nomination, other U. S. refiners and their requests include General Petroleum Corp., Ferndale, Wash., 11,500 bbl. daily; International Refineries, Inc., Wrenshall, Minn., 7,000 bbl; Lake Superior Refining Co., Superior, Wis., 4,000 bbl.; and Bay Refining Corp., Bay City, Mich., 2,000 bbl.



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SMOKE billows forth from a Long Beach tank farm following a costly explosion — but . . .

Hancock Plant Is Recovering From Fire

DESPITE an $8-million fire that swept the Hancock Oil Co. refinery at Long Beach, customers and outlets of the refinery are receiving regular deliveries—thanks to help from Hancock's competitors.

The fire at the 22,000-bbl. refinery took two lives, injured eight other persons, and did severe damage to the tank farm and a number of units.

John W. Hancock, president, said there would be no interruption in deliveries to distributors or to Hancock service stations.

Both Hancock and Vice President Newcomb D. Taylor praised their competitors highly for the emergency aid given.

"Our competitors were helping us within 30 minutes after the fire started," Taylor said. "Signal Oil & Gas Co. and Century Oil Co. across the street both helped immediately."

And shortly after, Hancock was shipping refined products from Richfield Oil Corp., Tidewater Oil Co., Wilshire Oil Co., and others.

The damage . . . Bulk of the damage occurred in the tank farm, although a 3,000-bbl. cat reformer and a 12,000-bbl. cat cracker suffered sufficient damage to require extensive repairs.

The reformer and cracker were built in the last 2 years as part of an $11-million expansion program at the refinery.

At the tank farm 13 tanks with a combined capacity of 570,000 bbl. were destroyed. Total capacity for the farm was 700,000 bbl.—in 21 tanks ranging in size from 10,000 bbl. to 80,000 bbl.

The tanks where the initial blast occurred contained a heavy low-gravity partially refined product.

A Hancock spokesman said repair and rebuilding would start immediately, and the plant probably will be back on full stream in 6 months.

The company said all losses were covered by insurance.

The fire . . . While the exact cause of the original blast is not specifically known, it is believed that steam coils in a 60,000-bbl. crude storage tank overheated and caused the tank to burst into flames.

Quickly the burning crude spread throughout the 40-acre refinery.

The fire raged for 3 days before burning itself out. At one point nearly 500 firefighters were at work. More than 100 Air Force firemen used special aircraft fire-fighting equipment.

The two persons killed in the disaster were James W. Edwards, 66, superintendent of pumping, and Woodward H. Langford, 44.

Edwards was trapped in the processing area while trying to turn off valves. Langford died when a torrent of burning crude poured into the company parking lot, where he was trying to remove his car.

Of the eight others injured, three were firemen. More than 100 refinery personnel fled to safety.

Sale reported . . . The blaze occurred in the middle of reported negotiations between Standard Oil Co. (N. J.) and Mrs. Will J. Reid, principal stockholder in Hancock, for sale of Mrs. Reid's controlling interest to Jersey.

Hancock officials last week officially announced "a major eastern oil company" is negotiating for the company. The statement said "all Class A and Class B" Hancock stockholders will "share alike" if an acceptable offer is made.

The report is that Mrs. Reid wants to swap her Hancock stock for Jer-

sey stock on a 1¼ or 1½ shares for Jersey for every Hancock share. Charles R. Gaylord, a Hancock director, is representing Mrs. Reid in the negotiations. He declined to comment on the status of the deal.

Hancock stock has soared in the past month from 28 to 49⅝. It started to go up about a month ago just after a Los Angeles market analyst recommended it "as an excellent opportunity" to his clients.

At the same time, the Jersey purchase rumors started.

The stock hit the 50 mark within 36 hours after the fire died. It closed last Monday, May 26, at 51½ but fell off five points the next day to 46½.

The company itself has shown steady growth since it was founded 37 years ago. At that time it had 54 stockholders. It now has 6,000 stockholders. Its last financial statement listed assets of nearly $65 million and yearly output of 8,500,000 bbl.

Salt Dome Tapped

again. New Pescadito well hits good Wilcox gas pay.

SOUTHWEST TEXAS' gigantic Pescadito salt dome, proved productive for the first time early in May, already has virtual assurance of its second well.

The prospective new well is Ginther, Warren & Ginther's 1-C O. W. Killam. It is nearly 2 miles southwest of the newly completed discovery well, the 1-B Killam, drilled by the same operators.

Like the discovery, the second well appears to be a good Wilcox gas producer. Testing a 44-ft. open-hole interval at 6,808-52 ft., it flowed at an estimated 1,700,000 cu. ft. per day.

Flow was through ¼-in. top and bottom chokes with drill-stem tester open 32 minutes. Bottom-hole pressures were 2,115 to 2,125 psi. flowing, and 3,680 psi. shut in. Pipe recovery was 160 ft. of heavily gas and condensate-cut mud.

Depth of the pay is slightly more than 800 ft. greater than that of the discovery, completed at 5,994-6,032 ft. (OGJ, May 12, p. 91). The latter produced at the rate of 9,000,000 cu. ft. per day during completion tests.

Gulf Oil Corp. and Michel T. Halbouty are associated with Ginther, Warren & Ginther in the drilling of these wells, and in a previously started ultradeep test, 1-A Killam. The latter now is below 13,200 ft. in new hole after sidetracking the first hole, drilled to 14,004 ft., where ultrahigh pressures were encountered.

Upswing for West

by 1960 predicted by Union Oil's Parker at API meet.

THE CALIFORNIA oil industry may expect an upswing in business by late 1959 or 1960.

That outlook for the West Coast was given by Charles F. Parker, vice president of Union Oil Co. He addressed the annual spring meeting of the Pacific Coast district, Division of Production, API, in Los Angeles.

Parker analyzed California's current troubles as due to two factors: Long-term competition from outside sources of oil and natural gas and low demand stemming from the business recession.

The Union Oil official said the general economic condition undoubtedly will right itself, but the long-term trends will offer more difficulties. In this connection, he said these trends have restricted the market for California crude:

... **Its share of the West's energy needs** dropped from 65% in 1950 to 45% in 1958.

... **Five pipelines** have been built into the West since 1952. Their total crude and product capacities are 450,000 bbl. daily and currently they are taking more than 250,000 bbl. daily of the market formerly filled by California crude.

... **Natural gas** supplied 20% of the West's energy needs in 1950. It now supplies almost 35%. Natural-gas consumption in the five western states equals more than 600,000 bbl. daily of fuel oil. Only a third of this gas is produced in California.

... **Energy growth** in the West averaged 4 to 5% per year for the first 10 years after World War II, but now has leveled off to only 2%.

Parker estimated that crude production in California should increase from a low of 820,000 bbl. daily to as high as 900,000 bbl. next year or in 1960.

Oops, Our Face Is Red!

IN AN ARTICLE in last week's issue, three authors were erroneously identified.

The article was "Here's How to Calculate Maximum Net Profit From Hydraulic Fracturing," p. 81-88. Authors George C. Howard, Don H. Flickinger, and C. R. Fast are with Pan American Petroleum Corp., not Amerada Petroleum Corp.

On p. 82, in the example well, under "Fracturing Conditions," the proper dimensions for fluid-loss coefficient are:

$$ft.^3/ft.^2/min.^{1/2}$$

—*Processing* briefs

Imperial Oil, Ltd., will increase capacity of its Sarnia, Ont., refinery from 78,800 bbl. to 94,000 bbl. daily. The $5,360,000 program will include additions to distillation and cracking units and improvements to piping, storage, and blending facilities. Completion is scheduled in mid-1959. Imperial is also building a $28,500,000 petrochemical plant at the Sarnia refinery site, scheduled for completion this fall.

Clark Oil & Refining Corp. has completed two new units at its 25,000-bbl. Blue Island, Ill., refinery. On stream are a 12,500-bbl. fluid catalytic cracking unit and a 1,500-bbl. HF alkylation unit, both designed and licensed by Universal Oil Products Co. Procon, Inc., built the cat cracker, which is one of the largest in the Chicago area. The project was part of a $7,250,000 expansion program at Blue Island.

Pacific Petroleums, Ltd., has put on stream a new Platforming-Unifining unit at its refinery in Fort St. John, B. C. The 3,250-bbl. Unifining unit accomplishes a dual purpose. It serves as a pretreater for the Platformer and also as a diesel-fuel treater.

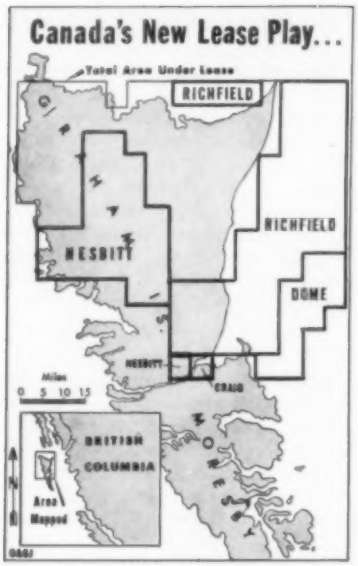
Feed stock to the Unifining unit is a blend of depentanized Permo-Penn and Triassic D zone distillates. The 2,000-bbl.-daily Platformer is operating on a 400°-end-point depentanized naphtha. The Platforming unit produces a motor-fuel blending component rated at 97 octane leaded.

Also for Refiners . . .

IN THE NEWS: Suntide is adding new ortho-xylene facilities at its Corpus Christi plant to broaden its activity in petrochemicals (p. 65) . . . U. S. has overbuilt its butadiene capacity. It may take 7 years for demand to catch up (p. 66) . . . Showdown voting on imports-control plan comes in House this week (p. 68) . . . Indiana Standard and independent union sign wage-raise agreement (p. 69) . . . With help from competitors, Hancock fills its orders after disastrous fire. Plant may get back into production soon (p. 80).

PLUS THESE TECHNICAL REPORTS: How fuel makeup affects car pickup (p. 90) . . . A different dehydration plant (p. 102) . . . Considerations in selecting air-cooled exchangers (p. 106) . . . More on SBA acetylene (p. 125).

INDUSTRY BRIEFS



Islands Leased

off coast of British Columbia. Richfield takes biggest block.

AN UNEXPLORED chain of islands off the coast of British Columbia is the center of a new land rush about 400 miles northwest of Vancouver.

Four companies have acquired new leases covering more than 1,666,000 acres in the northern half of the Queen Charlotte Islands, just south of Alaska and about 45 miles from the Canadian mainland.

The islands, a partially submerged mountain range, are in the Hecate basin which contains unaltered sediments of Jurassic, Cretaceous, and Tertiary age.

Companies and new acreage acquired include:

... **Richfield Oil Corp.,** 945,578 acres mostly off the coast of Graham Island, the largest of the chain.

... **Bertram I. Nesbitt,** Vancouver mining geologist, 511,352 acres mostly on land west of the main Richfield block.

... **Dome Exploration (Western) Ltd.,** about 190,000 offshore acres, southeast of the big Richfield block.

... **Charles E. Craig,** British Columbia geologist, 19,140 acres centering at Skidegate Inlet which separates Graham and Moresby islands.

More than a million acres were already under lease before the new grants were made. Canadian Homestead Oils, Ltd., holds 524,037 acres in its own name and reportedly controls the biggest share of the holdings of Y. Yandell, Jr.

Yandell and J. L. Loweseth acquired 207,271 acres, and Consolidated Mic Mac Oils, Ltd., has 338,095 acres.

Standard Oil Co. of California is nearing its objective depth in the 1 Deep Creek Unit in the southern part of Alaska's Kenai Peninsula. The operator is drilling below 11,725 ft. The Coastal Drilling Co. rig on the job is rated at 14,000 ft. At the only other active drilling project in Alaska, Humble Oil & Refining Co. was still trying to recover 121 ft. of drill collars and bit stuck at 10,867 ft. The wildcat is in the Wide Bay-Kanatak area on the Alaska Peninsula.

Imperial Oil, Ltd., has joined the new rush for leases in northern Canada. The company has applied for 3,000,000 acres in the Willow Lake region of the Northwest Territories. This is about 250 miles southeast of Norman Wells field where Imperial found production in 1920.

The acreage, which involves 56 separate permits, lies between two blocks sought by Shell Oil Co. of Canada, Ltd. The recent land rush in northern Canada involves millions of acres in the Mackenzie Delta and Hay River areas and the Queen Charlotte Islands.

The Petroleum Equipment Suppliers Association will hold its twenty-third annual 5-day meeting at Chateau Frontenac in Quebec beginning June 28. About 350 PESA members are expected at the meeting.

A big producer has been added to the Denver basin's new hot spot, Allchin field in Kimball County, Nebraska. British-American Oil Producing Co.'s 4 Petsch extended Allchin field when it recovered 1,036 bbl. of oil in 24 hours on test of the "J" sand. Two other wells are active in the new field which now has four producers (see related story p. 199).

Phillips Petroleum Co.'s important 1 Llanos discovery in northwestern Kansas swabbed 10 bbl. of oil per hour from Cherokee sand perforations at 4,804-12 ft. The company is now setting tanks at the discovery, which is a far-removed wildcat 20 miles northeast of Goodland in Sherman County (OGJ, May 19, p. 263). Other Pennsylvanian pay zones were found in the wildcat, but tests haven't been made yet. Nearly all acreage within 50 miles of the well has reportedly been leased.

The British American Oil Co., Ltd., 7-34 Dick Lake discovery 40 miles northwest of Red Deer, Alta., is Canada's biggest gas producer, according to unofficial reports from Calgary. Before the big Devonian D3 gas well was shut in last February, it had a reported absolute open flow potential of 288,000 M.c.f. per day. However, official data on the well, which is 51 miles southwest of Edmonton, may be lacking for some time yet. Another well in Dick Lake field, the British American et al 8 Davidson, flowed 42,000 M.c.f. daily.

Drilling employes of Phillips Petroleum Co. have rejected representation by the International Union of Operating Engineers, AFL-CIO.

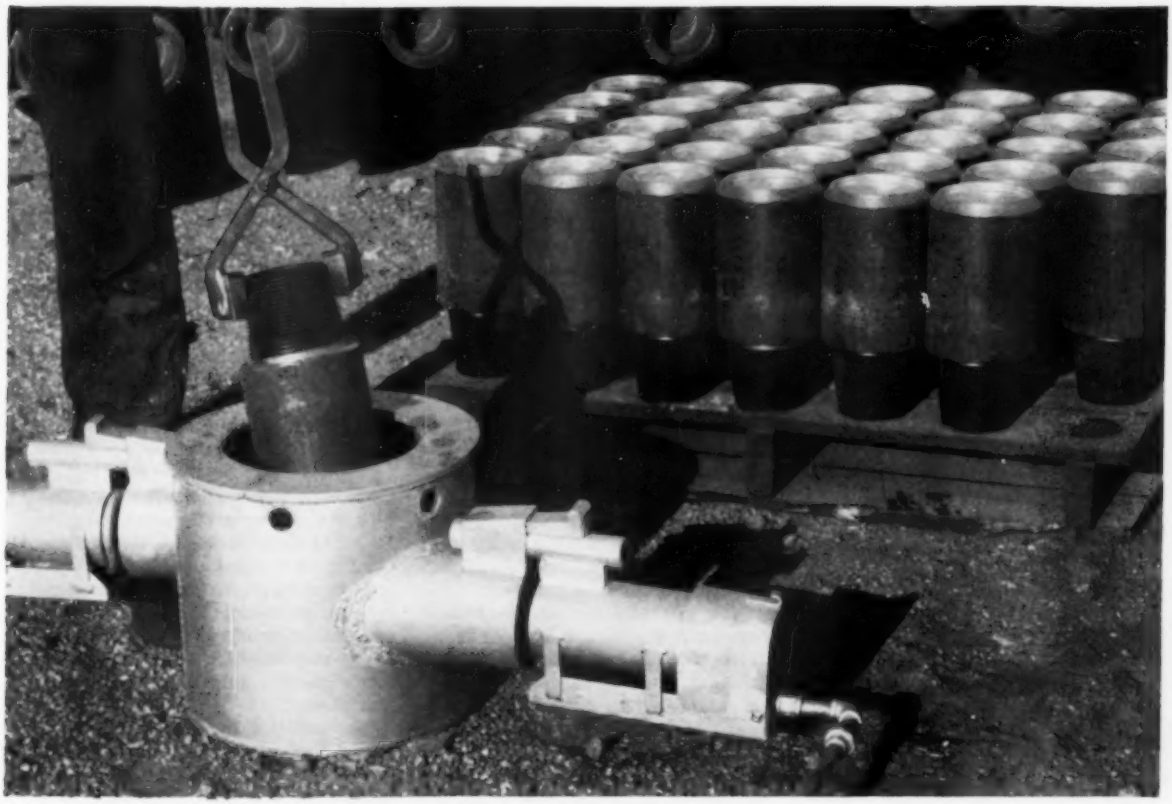
The election was conducted by mail ballot among all employes below the job of driller on Phillips' 18 drilling rigs. The vote was 156 against the union and 44 for. Ballots were counted by agents of the National Labor Relations Board at El Paso, Tex.

The Kansas oil allowable for June will be held at 305,000 bbl. daily, because of increased aboveground storage and a weak crude market. This is the third straight month that the state corporation commission has held the allowable to that figure, which is 36,000 bbl. daily below the February allowable. The Bureau of Mines had estimated June demand for Kansas crude at 310,000 bbl. daily.

Encouraging reports from Howell & Howell's 1 Anadarko Basin have captured the attention of the southern Oklahoma oil industry. Operators report the deep well is running some 1,400 ft. high to the nearest deep test on the structure, and it has logged 160 ft. of Morrow sand, apparently all gas bearing. Operators will not test until casing has been set because the well threatened to blow out.

The important test topped the Springer shale at 15,580 ft. and logged Springer sand at 15,725 ft. If no faults are encountered, the well could top the basal Oil Creek sand or the Arbuckle above 21,000 ft., considerably higher than originally anticipated. The crew currently is drilling ahead below 16,098 ft.

Washington is the twenty-ninth state to join the Interstate Oil Compact Commission. The agreement was signed recently by Gov. Albert D. Rosellini. Washington became the nation's thirty-second oil-producing state last year when Sunshine Mining Co. et al found pay at the 1 Medina in Grays Harbor County on the Pacific Ocean beach (OGJ, Jan. 27, p. 229).



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Half of U. S. Rigs Idled

. . . and outlook for capacity operation not good, drilling men told. Real fault lies in poor business practices.

DRILLING CONTRACTORS cannot stay in business if they continue to operate as they are at present.

This is how a supplier laid it on the line for an audience of drilling contractors in Dallas last week.

The supplier representative was C. L. Vickers, treasurer and credit manager of Continental-Emsco Co. He was one of four speakers on a "current industry issues" program staged by the Dallas-Fort Worth chapter of the American Association of Oilwell Drilling Contractors, May 26.

Others were: J. U. Teague, president of AAODC and of Columbia Drilling Co., Houston; E. B. Miller, Jr., vice president of Tidewater Oil Co., Houston; and Eugene M. Locke, president of the Texas Independent Producers and Royalty Owners Association and partner in Locke, Locke & Purnell, Dallas.

Vickers said there are about 3,400 rigs available—roughly 1,000 bought before 1949 and still capable of running, 1,566 bought between 1949 and 1953, and 844 bought from 1954 to 1957.

These rigs represent an original cost of from $600,000,000 to $700,000,000. It would cost close to $1,000,000,000 to replace them now. At last count there were only 1,792 rigs active in this country.

"I do not feel that you can anticipate at any time in the immediate future that demand for rigs will equal the availability of equipment. This being the case you are confronted with a serious problem," Vickers said.

What's the matter? . . . Vickers said the drilling industry has ignored good business practices.

He blamed this condition on the anxiety of contractors to compete for a limited number of holes. And he warned the result is that contractors don't stand a chance at present footage prices of replacing their rigs.

"You are tough traders when you buy a drilling rig," Vickers said. "What happens to this trading ability when you make a contract?

"You are tough financial men when you trade with supply-house credit men. Why do you pay thousands of dollars in interest because you are afraid to ask the operator for your money when the job is completed?

"Why is it that other lines of industry can make some money and full depreciation operating at 50% of capacity and you (contractors) go into the red when you drop below 75%?

"You represent the only industry in America that has gone through 15 years of inflation without a price increase. Are you going to let your industry destroy itself?

"Your equity in drilling rigs is worth several hundred million dollars. Are you going to wash it down the drain?"

The entire oil industry will suffer, Vickers said, if the drilling contractors are forced to the wall because of bad contractor business practices.

"You can recover from the present crisis only if each of you makes a firm decision to assume your responsibility to yourself, to your creditors, and to the industry to conduct your business as a businessman in a free enterprise that operates for a fair profit."

Contractors agree . . . Teague readily agreed that the drilling contracting business is in bad shape.

He said the drilling industry fluctuates with the economy as a whole just like any other heavy industry. But it also appears to suffer more in depressed times than other industry segments because of its highly competitive nature.

Other industry segments have been able to maintain their prices fairly well even in the face of reduced demand.

"But this certainly has not been true of the contracting business."

"The price situation has deteriorated to the point where it is becoming intolerable. Our plant is deteriorating, and we are selling off our capital assets. The sad part of it is that the contractor has only himself to blame. He is paid what he charges. No customer can be expected to pay more than he has to for a service, nor will he."

The simple fact is, Teague said, that there are either too many rigs or too little work.

"Prices will not adjust to a satisfactory level until we contractors adjust the number of rigs to demand, whatever demand might be."

Role of supplier . . . Contractors, he said, ask supplier help in making this adjustment.

Suppliers can help by hesitating to start new untried people via credit in the contracting business—also by taking every opportunity to cut the cost of distributing goods.

Specifically, suppliers could and should reduce the number of sizes and types of draw works and pumps and other equipment they build. They should cut out deliveries to the rig free of charge.

Operators also could help, Teague said, by limiting their bid invitations to no more than half a dozen reputable contractors, solvent and with good equipment. They could also help by limiting their requirements that contractors furnish special and unusual equipment seldom used.

Pitch for cheaper production . . . The economy angle was stressed, too, by Miller of Tidewater—this time as applied to production.

The problem, he said, of developing and producing U. S. oil and gas reserves "as economically as we know how" may well be the determining factor in maintaining a healthy domestic industry.

The domestic industry is unrealistic if it fails to recognize that domestic production is in competition with the world supply of oil. It is unrealistic if it fails to recognize that cost goes hand-in-hand with competition.

If the U. S. is to improve its competitive oil position, every operator whether large or small, every royalty

PIPELINE

Trans-Canada Pipe Lines, Ltd., has begun clearing and ditching operations for the final season of construction on its Alberta - Montreal gas line, which will be completed this year when the Ontario gap has been filled in. Pipe laying will begin shortly. Price-Poole Pipeline Constructors of Canada, which has one of several spreads on the project, is also double jointing pipe for Oklahoma Pipe Line Constructors, Inc., on the Oklahoma section.

Texas Eastern Transmission Corp. plans to install 231,200 hp. in compression this year to expand transmission capacity by 100,000 M.c.f. daily. This is the largest horsepower program in the industry, following the company's 1,000-mile looping in 1957.

Texas Eastern will build eight new stations and expand 13 others. The expansion is dominated by gas-turbine installations. Five of the new centrifugal stations and seven existing ones

owner, and every regulatory body must see to it that the industry produces oil as economically as it can without physical waste.

We are not doing this when "26 oil wells are drilled on 13 acres, when an operator asks to drill an 11,000-ft. well on 5 acres, when it is necessary to install separate facilities for measuring oil and gas on each individual property when a centralized system could have been installed for half the cost," Miller said.

To do the job, Miller said, the domestic industry needs:

... **Equitable unitization** law in all states without them . . . especially Texas, due to its prominent place in domestic production.

... **Change in spacing** concept that 20 or 40 acres for oil and 80 to 160 acres for gas constitutes wide spacing.

... **Proration formulas** which include proved reserves as a dominant factor rather than those giving disproportionate weight to the well factor. Louisiana, he said, is now studying a formula based 50% on reserves.

... **Special offshore rules** which would permit offshore oil's proportionate share of total production to be produced from as few wells as can efficiently drain a field. These are needed because of the unique conditions offshore (high cost, single royalty ownership, transport problems) and its importance to national security.

... **State regulations** which don't deny the operator the right to use to the fullest new developments in completion, measuring, and operating techniques and equipment. This means such things as multiple completions, metering oil and gas, lease automation, and any other method or device which adds to production economy. Rules should encourage, rather than deny, application of such methods.

New Styrene Plant on Stream

EL PASO Natural Gas Products Co. has placed a new styrene plant on stream at Odessa, Tex., with capacity of 40,000,000 lb. per year.

The plant will be operated by Odessa Styrene Co., 75% owned by El Paso Natural Gas Products. Plant manager is Gus Z. Moore.

The styrene plant is the third unit of an integrated synthetic-rubber installation at the Odessa site. About 50% of its output will go into synthetic rubber at General Tire & Rubber Co.'s adjacent copolymer plant. The rest is contracted for sale to eastern firms.

El Paso Natural Gas Products last year completed a $22,000,000 butadiene plant at Odessa to furnish the other prime rubber ingredient to General Tire. This plant has a capacity of 50,000 tons a year. General Tire takes 32,000 tons of this.

This summer, the company will complete a new oil refinery on the site adjacent to the petrochemical plant.

Royalties Are Sold

for $4 million-plus by Sohio to southwestern syndicate

SOHIO Petroleum Co. has sold producing oil and gas royalties and minerals to a syndicate for more than $4 million.

The royalties and minerals are located in 400 separate tracts in 12 states.

Fifty per cent of the buying syndicate is owned by Oil & Gas Property Management, Inc., and John R. Less and others, Dallas. John A. Crichton is president of Oil & Gas Property Management, which will manage the syndicate.

Western Hemisphere Petroleum Corp., organized in Tulsa in 1956 and headed by Russell Cobb, Jr., owns 25% of the syndicate. The other 25% is owned by Georesearch, Inc., Canuck Oil Corp., Barron Kidd, trustee, and Metropolitan Dallas Corp., all of Dallas.

The royalties and minerals involve some 4,200 oil and gas wells in Texas, Louisiana, Oklahoma, New Mexico, Illinois, Indiana, Kansas, Kentucky, Michigan, Mississippi, Montana, and Wyoming.

The deal was closed at the office of the Texas National Bank, Houston. The Houston bank, together with Empire Trust Co., New York, made loans in connection with the purchase of production payments.

BRIEFS . . .

will have 150,600 hp. of gas turbines installed this summer and fall. The Egypt, Miss., and Mount Pleasant, Tenn., stations will be expanded with single-unit, 15,000-hp. electric motors introduced by Texas Eastern last year. The remaining 50,600 hp. at seven stations will be conventional gas-engine reciprocating units of the type used on most transmission lines.

Caroline Pipeline Co. is nearing completion of a 17-mile, 2 to 12-in. transmission system from Blacksburg, S. C., where it connects with Transcontinental Gas Pipe Line Corp., to Camden, S. C. The company is making deliveries through part of the line. The final section of the line will be placed in service around July 1. Ultimate capacity of Caroline Pipeline is 40,000 M.c.f. daily. Initial authorized firm sales amount to 23,612 M.c.f.

North Carolina Natural Gas Corp., which also will take gas from Transco, will get under way in July or August. The project involves 630 miles of 2 to 16-in. from Mooresville, N. C., eastward across the state. The FPC has approved sales of 39,780 M.c.f. daily for North Carolina Natural, headquartered at Fayetteville, N. C.

Natural Gas Storage Co. of Illinois plans to develop storage in another sandstone formation which may be greater than the original reservoir used at its big Herscher project. The company has asked FPC permission to develop the Mount Simon, which is found at 2,450 ft., 600 ft. below the Galesville formation from which 430,000 M.c.f. can be withdrawn on a peak day.

Natural Gas Storage, which is owned by customers of Natural Gas Pipeline Co. of America and Texas Illinois Natural Gas Pipeline Co., will spend $2½ million on the project. A gathering system, another 1,330-hp. compressor plant for gas injection and withdrawal, and three observation wells are planned.

New York State Natural Gas Corp. plans to lay 83 miles of pipe in New York and Pennsylvania this year. Pipeline Maintenance & Construction, Inc., has 12 miles of 30-in. under contract in Tompkins County, New York; Harford Brothers, 13 miles of 20-in. in Potter County, Pennsylvania, and 20 miles of 6 to 12-in. in the Leidy storage pool; Joyce Pipe Line Co. 30 miles of 20-in. in Erie County, New York; and Felmont Oil Corp., 8 miles of 6 to 12-in. in the Woodhull storage project, Steuben County, New York.

Also for Pipeliners . . .

IN THE NEWS: FPC Commissioner Connole, in an exclusive interview with the Journal answers some questions on how far should gas regulation go (p. 70).

PLUS THESE TECHNICAL REPORTS: Protective coatings for buried pipelines (p. 93) . . . External coating tests by Humble (p. 145).

Congrats and $25 to R. W. WARING, 511 Oil & Gas Bldg., Oklahoma City.

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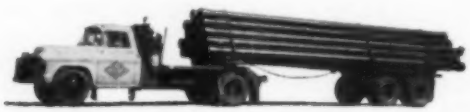

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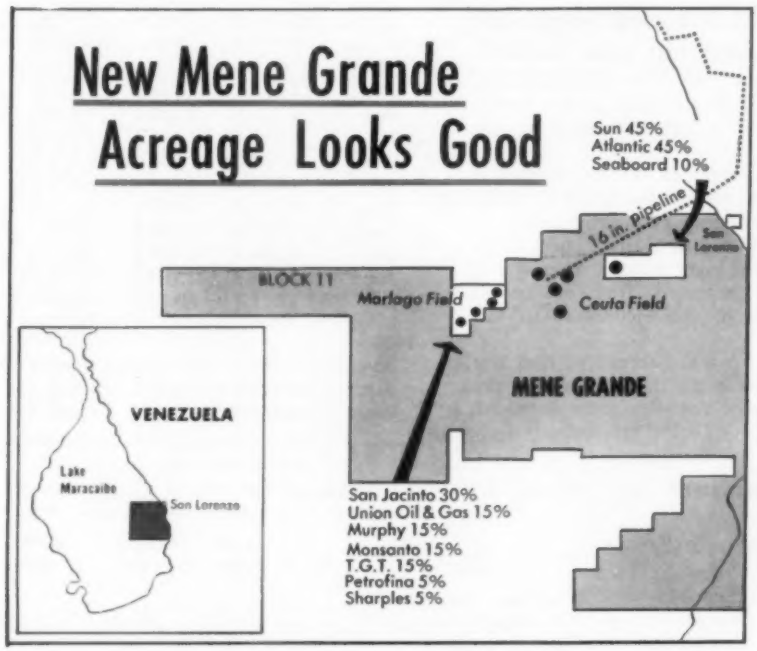


Activity Spurts in Maracaibo

MENE GRANDE Oil Co. (Gulf) has a new lease on life in western Venezuela.

New lake concessions, as yet untested, and a good new Lake Maracaibo field at Ceuta, have given the country's third biggest oil producer a new outlook.

Meneg was drilling its Ceuta 1 on the eastern edge of the lake in the spring of 1956 when the Venezuelan Government opened up the lake acreage for new concession bids. The Gulf subsidiary submitted bids for several blocks of national-reserve acreage adjoining what is already held along the lake edge. The company got the acreage except for two small blocks that went to combines of newcomers.

A short time later Ceuta blew out and caught fire. Once the well was controlled, it tested more than 4,600 bbl. daily of 39°-gravity crude. Since then Meneg has completed three more wells in the same area and has built a 22-mile, 16-in. pipeline to move the crude. The three later wells haven't measured up to the discovery, but all are capable of producing from 1,200 to almost 2,800 bbl. daily.

The developments at Ceuta and other nearby areas give strong evidence that the newer Mene Grande concessions—to the east, west, and south—will find oil when tested.

On an adjacent block to the west a combine headed by San Jacinto Oil Co. has completed four flush producers at Marlago field. A fifth Marlago well is reported to have found a net 180 ft. of pay.

The new activity has put new life into what was once pretty much a stripper operation for Mene Grande along the eastern shore of the lake. The company is now busy building a three-story office building in Lagunillas to house its western division staff. Meneg plans to build 38 houses for an expanded staff. The latest addition to facilities will be six new 25,000-bbl. storage tanks at Bachaquero to handle the new production.

Paria Test Successful

THE FIRST well drilled on the Venezuelan side of the Gulf of Paria is a commercial discovery and a second test is now under way.

Poza 112-1, the first effort of a five-company combine on $100 million bonus concessions, drill-stem tested 1,500 bbl. daily of 20° gravity crude from two sands between 4,000 and 4,500 ft. It was dually completed.

The rig which drilled the successful test was moved to a second permanent platform 4 miles to the northwest and has already spudded a second well.

Paria Operations, Inc., operator of the offshore concession, recently let a contract for a second rig to operate from a multiple-well platform (OGJ, May 26, p. 73).

Monagas Producer

gives Pan Venezuelan new hope for costly acreage.

AFTER A SECOND LOOK, Pan Venezuelan Oil Co. has decided its new southern Monagas tracts in eastern Venezuela may not look so bad after all.

The company released two rigs in March after drilling four dry holes and four heavy-crude producers on the three blocks for which it paid $35 million in bonuses. Last week the company was looking for bids to drill four or five more wells in the area.

One thing which gave the area a little brighter future was Mona J-5, the fifth offset the company drilled to Creole Petroleum Corp.'s shut-in Jobo field. Mona J-5 tested 2,000 bbl. daily of 14°-gravity crude on a 3-in. flow line.

Creole now has 16 shut-in producers at Jobo, just south of the Pan Venezuelan block. The field has never been produced. Both the Creole and Pan Venezuelan production lies to the west of Temblador field.

The new Pan Venezuelan producer is the seventh hole drilled on what the government offered as Block 11 in its new acreage in southern Monagas. Two wells to the north of the five Mona-J producers were dry holes (OGJ, Mar. 31, p. 70).

CREPS Scores in Algeria

ALGERIA'S FIFTH oil field has apparently been discovered.

Cie. de Recherches et d'Exploitation de Petrole au Sahara (CREPS) said in Paris it has a new discovery in the southeastern Sahara at Oued Oubarakat.

The new well is about 59 miles southwest of Edjele, the original CREPS discovery which started that Sahara oil boom 2 years ago. No details were given but the French-Shell company said the test found oil. It is presumably shallow like that at Edjele, Tiguentourine, and Zarzaitine to the north.

World Output Drops

. . . to lowest ebb in 14 months. U.S. and Venezuela take big cuts, but Middle East hits new record.

FREE-WORLD crude production in March sank to the lowest level since 14 months earlier when the industry struggled to get along without the Suez Canal.

United States producers took the biggest cut. U. S. output was off nearly 19% from the all-time record set in March 1957. Venezuelan operators also took a stiff cut, giving up February gains.

The Middle East again was the only region to show an over-all increase, reaching its third straight all-time high. Kuwait, Iran, Qatar, and Bahrain each had the best month on record. Iraq reached the highest level since the pipeline system to the Mediterranean was sabotaged during the Suez crisis.

Indonesian production dropped due to the outbreak of civil war in Sumatra. Caltex, the largest producer in the country, shut down for 2 weeks. But its average for the month fell only about one-third, to 93,300 bbl. daily. Stanvac was off about 10,000 bbl. daily.

TREND OVER THE LAST YEAR

	Western Hemisphere less U. S.	Middle East	Total, Free World outside U. S.
1957			
Mar.	4,084.1	2,764.2	7,548.0
Apr.	4,111.5	3,140.0	7,985.0
May	4,116.0	3,556.1	8,407.3
June	4,160.6	3,957.3	8,872.5
July	4,076.2	3,989.4	8,824.7
Aug.	3,924.5	3,955.0	8,649.6
Sept.	3,759.6	3,969.5	8,504.6
Oct.	3,758.8	3,878.9	8,435.5
Nov.	3,654.7	3,704.2	8,142.9
Dec.	3,661.7	3,973.6	8,412.4
1958			
Jan.	3,680.4	4,034.0	8,465.6
Feb.	3,798.7	4,057.6	8,662.1
Mar.	3,650.3	4,243.0	8,602.5

World-Wide Crude Production: Daily Average in Thousands of Barrels

Country—	March 1958	February 1958	March 1957
Western Hemisphere			
Argentina	90.7	97.5	95.2
Bolivia	9.6	9.5	9.8
Brazil	43.0	43.0	23.8
Canada	458.0	505.0	514.8
Chile	14.6	14.4	11.0
Colombia	126.3	127.3	124.4
Cuba	1.1	1.2	1.1
Ecuador	9.3	9.3	8.1
Mexico	252.7	252.7	236.9
Peru	53.3	53.3	46.0
Trinidad	99.6	99.2	89.4
Venezuela	2,492.1	2,586.3	2,923.6
Total	3,650.3	3,798.7	4,084.1
Africa			
Algeria	7.0	4.8	0.4
Egypt	50.2	60.0	34.1
Gabon	6.9	6.9	2.1
Morocco	1.5	1.5	1.6
Nigeria‡	6.0	3.1	.....
Total	71.6	76.3	38.2
Middle East			
Bahrain	37.5	35.6	30.0
Iran*	851.0	768.0	634.0
Iraq†	653.2	605.7	317.6
Israel	1.2	1.2	1.2
Kuwait	1,393.3	1,341.0	835.6
Neutral Zone	70.0	80.0	38.8
Qatar	185.8	163.1	122.3
Saudi Arabia	1,051.0	1,063.0	784.7
Total	4,243.0	4,057.6	2,764.2

Country—	March 1958	February 1958	March 1957
Other Asia			
British Borneo	119.0	119.0	119.0
Burma	9.2	9.2	7.0
India	8.5	8.5	9.2
Indonesia	250.0	337.0	283.9
Japan	6.8	6.9	6.4
New Guinea	5.4	5.8	6.9
Pakistan	5.9	5.9	5.9
Total	404.8	492.3	438.3
Europe			
Austria	54.4	56.4	61.5
France	26.8	26.8	28.5
West Germany	82.0	84.4	73.6
Italy	21.6	21.6	19.3
Netherlands	32.0	32.0	25.6
Turkey	6.2	6.2	5.5
United Kingdom	1.7	1.7	1.7
Yugoslavia	8.1	8.1	7.5
Total	232.8	237.2	223.2
Free World			
Foreign	8,602.5	8,662.1	7,548.0
United States	6,273.0	6,809.0	7,717.0
Total	14,875.5	15,471.1	15,265.0
Communist Countries in Soviet Orbit			
Romania	230.0	230.0	223.0
Russia	2,130.0	2,130.0	1,860.0
Others	60.0	60.0	50.0
Total	2,420.0	2,420.0	2,133.0
WORLD TOTAL	**17,295.5**	**17,891.1**	**17,398.0**

*Includes estimated 5,000 bbl. daily from Naft-i-Shah field not operated by consortium companies. †Includes estimated 3,600 bbl. daily from Naft Khaneh field, operated by British Petroleum Co. ‡Test production.

Figures are from reliable industry reports or official government sources. Data for Communist countries in the Soviet orbit, which includes the European satellites and Red China, are based on competent estimates. Authentic information is not available on month-to-month production in these areas. Estimates also were made where complete reports are lacking.

New Creole Success Disclosed

CREOLE Petroleum Corp. took the wraps off its central Lake Maracaibo drilling program last week to reveal that flush production is moving south.

H. W. (Duke) Haight, Creole president, disclosed some production figures on new Creole wells in the lake to his stockholders at the annual meeting in New York.

Haight said that "from the center on west" the 25,441-acre Block 5 now appears to have "very prolific production." One dry hole and one "small producer" were drilled on the eastern edge of the block.

Creole paid $24,995,000 in bonuses for the tract, or about $982 an acre in the first bids for new lake concessions in 1956.

Haight told his stockholders that Creole's results in lake drilling have "been concealed for competitive reasons."

He also said two Creole offsets to Superior Oil Co.'s very prolific block of national-reserve acreage have been completed for good wells. He estimated that the "Golden Lane" productive trend, as it has been dubbed in Venezuela, will extend on north well into old Creole acreage.

"We don't expect it to continue north indefinitely," he conceded, but he added that Creole has another 20 locations planned which they believe will be productive.

Here's the Creole count on its wells:

... **CLA-4,** on the eastern edge of Block 5, was a dry hole.

... **CLA-2,** in the southeastern corner of the block, is a "small producer."

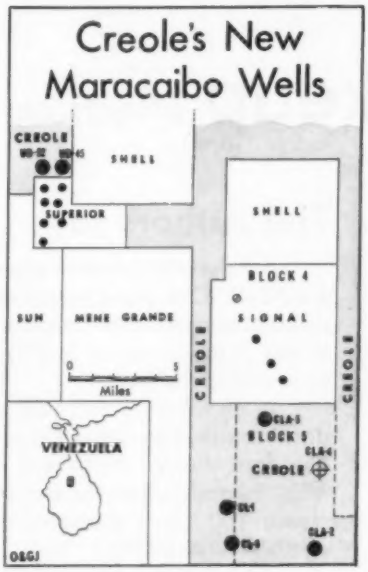
... **CLA-5,** in the northwest corner, last week tested 3,700 bbl. daily from the Eocene.

... **CL-1,** drilled more than a year ago, had already been spudded by Creole on the long finger of old lake acreage which runs down the entire west side of block 5. It is good for 1,600 bbl. daily.

... **CL-6** is the best well drilled yet in that area. It was spudded almost on the dividing line between the old and new acreage. It tested 5,000 bbl. daily.

... **UD-45,** just to the north of Superior Oil's "L-shaped" block, is good for 2,200 bbl.

... **UD-52,** just to the west of the first Creole offset, tested 6,000 bbl. daily.



Odeco Launches Gulf Venture

OCEAN DRILLING & Exploration Co. has announced details of a long-range drilling program to be conducted off the coast of Mexico for Pauley Pan American Petroleum Co.

By fulfilling certain drilling commitments the New Orleans-based company will qualify for an interest in Pauley's benefits under contracts with Petroleos Mexicanos. The area involved is some 3 to 10 miles wide and about 180 miles long in the Gulf of Campeche. It extends off the coast between Barra de Santacamopan and Barra de Paso Real.

Odeco's new drilling barge, the "El Dorado," was scheduled to leave for the Gulf of Campeche last week.

Pemex contracts permit Pauley and others to conduct geologic surveys of the submerged area and to test and develop up to seven geologic structures before March 5, 1964. Costs of exploration and development are to be paid from 50% of any production developed.

Odeco is committed to spend at least $500,000 and up to $3,000,000 in the exploration and development program. After the initial program is completed Odeco and Pauley plan to continue joint development of the area and to share equally in costs and income under the Pemex contracts.

In addition to recovering costs of exploration and development, Pauley and others would receive, in effect, a term royalty until March 5, 1974. This amounts to 18¼% of the value of any production developed in submerged lands other than lagoons and lesser percentages in lagoons or onshore.

In return for carrying out the drilling and exploration program Odeco is to receive Pauley's full share of the 50% reimbursement plus half of Pauley's share of the 18¼% term royalty. Pemex is to receive all production after 1974.

Refinery Plans Cancelled

THE WEST GERMAN refining picture still is bright, but apparently not rosy enough for one company to go ahead with a building project.

Tidewater Oil Co. has called off its refinery program at Rees in the heavily industrialized Rhine River area. Industry reports are that the company changed its mind in the face of tightening fuel-oil markets.

Fuel oil, however, was the chief reason refiners showed a 3.3% increase in runs the first quarter over the last 3 months of 1957. The product increased by 12.5% over the previous quarter to 73,400 bbl. daily. Total refinery production averaged 267,000 bbl. daily.

Gasoline held a shrinking lead at 80,200 bbl. daily. Diesel oil output was 65,700 bbl. daily. Other products totaled 47,700 bbl. daily.

Pakistan Puts Up Risk Money

IN CONTRAST to governments picking up an interest in exploration programs without actually putting up risk money, Pakistan this year will invest more than $7 million in several operations.

The biggest lump of over $2 million will go to Petroleum Development Corp. of Pakistan. This is a privately owned local firm which, like the government, has a minority interest in local subsidiaries of foreign companies.

The rest of the cash is going into operations partly owned by the government. Pakistan Petroleum, Ltd., and Standard-Vacuum Oil Co. each will get about $1.5 million.

The Pak-Hunt Petroleum Project, Tidewater Oil Co., and a Caltex subsidiary, American Overseas Petroleum Ltd., each will receive more than $500,000. Caltex does not hold a concession at present, but talks are in progress.

Pakistan Oilfields, Ltd., will receive $21,000. It has small crude production in northern West Pakistan.

How fuel makeup affects car pickup

The authors say . . .

Acceleration performance appears to improve steadily as the ASTM 50% point temperature decreases, at any given low ambient temperature. Too low a 50% point evidently can result in loss in performance quality at the higher ambient temperatures during the day.

In an effort to evaluate this lower limit, motor-fuel survey data obtained by Ethyl Corp. for the past 3 years were used. The data showed that there is marketing experience down to 150° F. and below for the 50% point (at 100° F. ambient). Hence 150° F. is probably above the lower limit for loss in performance quality.

A rating chart has been developed for the evaluation of the comparative acceleration performace of motor fuels marketed in different localities at different seasons of the year.

BY O. C. BRIDGEMAN AND
ELIZABETH W. ALDRICH
Phillips Petroleum Co.

ABILITY to obtain rapid acceleration is demanded by most car owners, even to the extent of paying a stiff penalty as regards fuel economy. Hence both the designer of the car and the petroleum refiner attempt in their respective ways to provide good car acceleration under a wide diversity of operating and ambient conditions. In general, they have been very successful in satisfying this demand.

The problem of engine acceleration is encountered under two different sets of circumstances. Once the engine has started, ease of warm up is usually judged by the acceleration performance of the vehicle during the early warming-up period. The vehicle designer contributes to good warm-up performance with automatic choke, so the carburetor keeps changing the mixture as the engine warms up.

Finally, the automatic choke ceases to function, and warm up is completed with normal operating mixture ratios. This is the second set of operating conditions under which good acceleration performance is desired.

Fuel performance . . . Analysis of the problem from the fuel standpoint has indicated that a fuel will give good warm-up performance provided it has a good rating as regards engine starting, and a good acceleration rating after the engine has warmed up to the point where the choke stops functioning.

An earlier article[1] discussed engine starting as affected by fuel characteristics. Therefore, this article will explore only the effect of fuel characteristics on engine acceleration with the automatic choke fully open. In making this conclusion, it should be pointed out that vapor-lock considerations were found[1] to restrict front-end volatility, and hence cause sacrifice in ease of engine starting during the winter and spring months when both low and high ambient temperatures prevail.

Insofar as vapor-lock considerations affect ease of engine starting, they will also affect ease of engine warm up. Thus, good performance in both of these regards can only be achieved at certain seasons of the year by riding the vapor-lock borderline as closely as possible.

Factors affecting acceleration . . . With any given fuel, the absolute acceleration will be specific for each vehicle and each set of operating conditions. In other words, the ability to accelerate is determined by the net engine torque which can be obtained at the given speed and at the actual prevailing load on the engine at this speed. Fuel enters into the picture only insofar as it may affect the maximum power output of the engine under the given operating conditions.

As such, the fuel characteristics determine the degree of acceleration relative to the maximum possible for the given vehicle under the particular operating conditions. Optimum acceleration is obtained if the fuel vaporizes sufficiently in the engine manifold to form an effective air-vapor mixture of about 12 to 1. With less vaporization due to lower volatility in the middle and upper portions of the ASTM distillation curve, leaner mixtures are formed.

The acceleration falls off as the air-vapor mixture becomes leaner, slowly at first and then with increasing rapidity. Thus at 16-1 effective air-vapor mixture, the relative acceleration is about 92% of that attainable with a 12-1 mixture. However, at mixtures of 18-1 and 20-1, the relative accelerations are about 73 and 37%, respectively. Fuel volatility under intake-manifold conditions therefore plays an important role in engine acceleration.

Relative acceleration . . . The basic information on the effect of fuel characteristics on engine acceleration was obtained by Brown.[2] Since it dealt with relative acceleration, the information was essentially independent of engine-design factors, and hence is closely applicable to present-day engines in passenger-car service. Brown presented only a partial analysis of his experimental observations, and in the intervening period there appears to have been little practical utilization of this information.

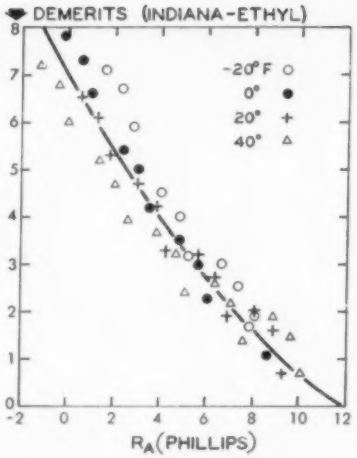
Recently, the authors of the present paper have made a detailed analysis of the Brown data, and this has led to the development of a rating scale R_A for engine acceleration with the automatic choke fully open. This rating scale is defined by the relation:

$$R_A = 30.2 - 0.1\,[t(50\%) + 0.15\,t(90\%) - 0.375\,\theta_L^*]$$

It is seen that the acceleration performance improves with decrease in ASTM 50% point temperature, and to a smaller degree with decrease in 90% point temperature. $\theta_L{}^*$ is the sea-level equivalent minimum ambient temperature, namely the observed temperature at the given altitude corrected to sea level by adding 1.25° F. for each 1,000 ft. altitude, which is the standard altitude correction in volatility problems.[3]

Acceleration performance . . . Moore, Young, and Toulmin[4] have recently presented information on the acceleration performance of some modern passenger cars, as influenced by fuel characteristics and ambient temperature. They used demerits to indicate the degree of performance below that of a perfect fuel, and they made available a demerit rating chart. Values of demerits read from this chart, for selected fuel characteristics and ambient conditions covering the ranges given in the chart, are shown in Fig. 1 plotted against R_A values. The over-all correlation is reasonably good.

The R_A rating system indicates that, at any given low ambient temperature, the acceleration performance becomes steadily better as the 50% point temperature decreases, at constant 90% point temperature. However, these same fuels which give good acceleration during the cold part of the day must also perform satisfactorily at the highest temperature during the day.



DEMERIT RATING CHART of Indiana and Ethyl correlates reasonably well with R_A values. Fig. 1.

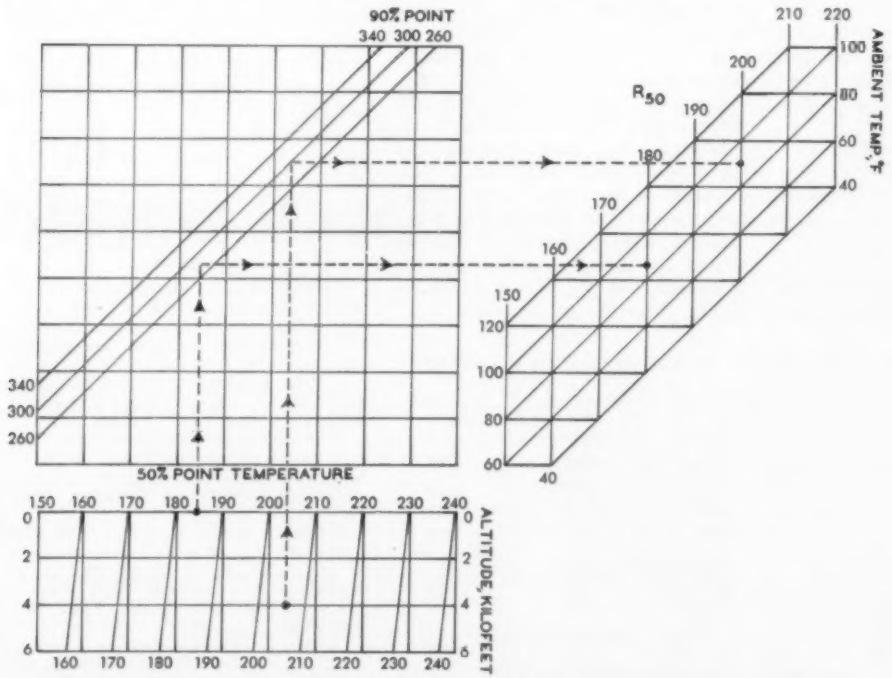
If the 90% point is low, and if the mixture temperature becomes high enough to exceed the effective dew point of the mixture, there will be loss in volumetric efficiency and hence in acceleration. Also, problems can arise during warm up when the volatility is too high relative to the settings of the automatic choke.

Experimental evidence with modern passenger cars which bears directly on this point is lacking. Therefore it becomes necessary to consider the characteristics of motor fuels which have been successfully marketed, as a basic for determining how far marketing experience has gone in improving acceleration performance.

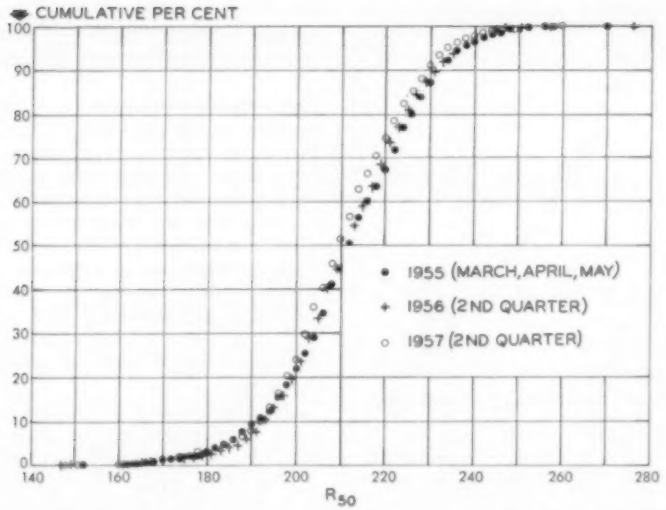
Equivalent performance . . . It is apparent from the equation defining R_A that it is possible to transform the 50% point value of a fuel, marketed in a given locality at a given time of year, over to a value giving equivalent acceleration performance under some selected set of reference conditions. Thus, keeping R_A constant for each fuel, reference 50% points R_{50} could be obtained which would be comparable independent of season or locality.

For the present purposes, the reference 90% point will be taken as 356° F., and the reference altitude as sea level. Since the interest now is in maximum ambient temperatures, the conventional value of 100° F. will be taken for the reference point. Weather Bureau data indicate that the average seasonal change in minimum ambient temperatures is about 1.85 times average seasonal change in maximum ambient temperature. Hence, for comparable performance, the change in 50% point should be $1.85 \times 0.375 = 0.7$ times the change in maximum ambient temperature, on the basis of the R_A equation.

However, studies of motor-fuel survey data for the past 3 years indicate that current marketing practice is better approximated by using a factor of 0.5 rather than 0.7. Accord-



PERFORMANCE RATING CHART for engine acceleration, with automatic choke fully open. Fig. 2.



R_{50} **VALUES** for today's motor fuels vary over an extremely wide range. Fig. 3.

ingly, the 0.5 factor will be used here, although the same general conclusions would be reached in both cases.

Rating chart . . . On this basis, a performance rating chart for engine acceleration (with automatic choke fully open) is shown in Fig. 2. The right-hand field covers the effect of ambient temperature, which is taken as the highest on record for the particular locality of interest and for the given time of year. The lower left-hand field covers the effect of altitude, whereas the intermediate field covers the effect of 90% point temperature.

The vertical lines in the right-hand field represents R_{50} performance ratings, namely the equivalent 50% point temperature under the reference conditions of sea-level altitude, 100° F. ambient temperature, and 90% point temperature equal to 356° F. The chart may be used either to evaluate R_{50} ratings for commercial fuels of known characteristics marketed in a given locality, or it may be used to develop marketing specifications for different localities or different seasons of the year, based on a preselected value of R_{50}.

Using the chart . . . Two examples will make clear the manner of using the acceleration rating chart. A fuel with 50% point temperature of 206° F. and a 90% point of 300° F. is marketed at an altitude of 4,000 ft. and an ambient temperature of 90° F. By following the line shown in Fig. 2, it is seen that $R_{50} = 200$. Similarly, if the 50% point is 184° F. and the 90% point is 280° F., this fuel marketed at sea level and 85° F. ambient temperature would have an R_{50} value of 180. The reverse procedure is used for developing marketing specifications from a selected value of R_{50}.

Using the equations underlying the above chart, values of the performance rating R_{50} were computed for the 9,686 commercial motor fuels sampled in the Ethyl Corp. motor-fuel surveys for the past 3 years. Without making distinction between regular and premium motor fuels, the distribution of R_{50} values is shown in Fig. 3 for the spring season.

TABLE 1—PERCENTAGE OF VALUES AT OR BELOW STATED R_{50} LEVELS

Season—	$R_{50} = 180$	$R_{50} = 200$	$R_{50} = 220$
Spring 1955*	3.5	22.1	67.3
Second quarter 1956	2.4	21.2	70.8
Second quarter 1957	3.5	24.1	74.6
Summer 1955†	2.9	19.8	65.5
Third quarter 1956	1.7	17.0	65.8
Third quarter 1957	2.4	19.3	70.5
Fall 1955‡	1.4	10.5	50.7
Fourth quarter 1956	0.8	9.8	52.6
Fourth quarter 1957	2.1	8.4	53.8
First quarter 1956	1.2	15.2	54.8
First quarter 1957	2.4	17.7	63.8

*March, April, May. †June, July, August. ‡September, October, November.

A definite small trend is evident over the 3-year period, but the most striking feature is the extremely wide range of R_{50} values for present-day commercial fuels.

Information on the distribution of R_{50} values for the four seasons is summarized in Table 1. Note that there is the same general trend with seasons as was found previously for the vapor-lock control ratings R_v[5] and the engine starting ratings R_{10}.[1] Since compensation has already been made for seasonal variations in ambient temperature, it would be expected that there would be little variation in the distribution patterns from a seasonal standpoint, unless other considerations entered the picture.

The downward drop from summer to fall, and the upward trend from winter to spring, suggest marked lags in changing seasonal grades of motor fuel. Also the considerably lower percentages of low R_{50} values in the cold weather suggests lack of availability of volatile blending agents in sufficient volumes to maintain uniform performance quality throughout the year.

Acceptable range . . . It is concluded from a study of the Ethyl Corp. survey data that an R_{50} value of 200 is conservative, whereas a value of 220 or higher is ultraconservative. There is considerable marketing experience in the range below 180, but very little below 150. It has been pointed out that the available technical information on engine acceleration indicates improved performance as the 50% point temperature decreases, but does not define the lower limit beyond which performance quality may suffer.

The present analysis of motor-fuel survey data creates confidence that this lower limit is certainly below R_{50} equal to 180, and possibly below an R_{50} value of 150.

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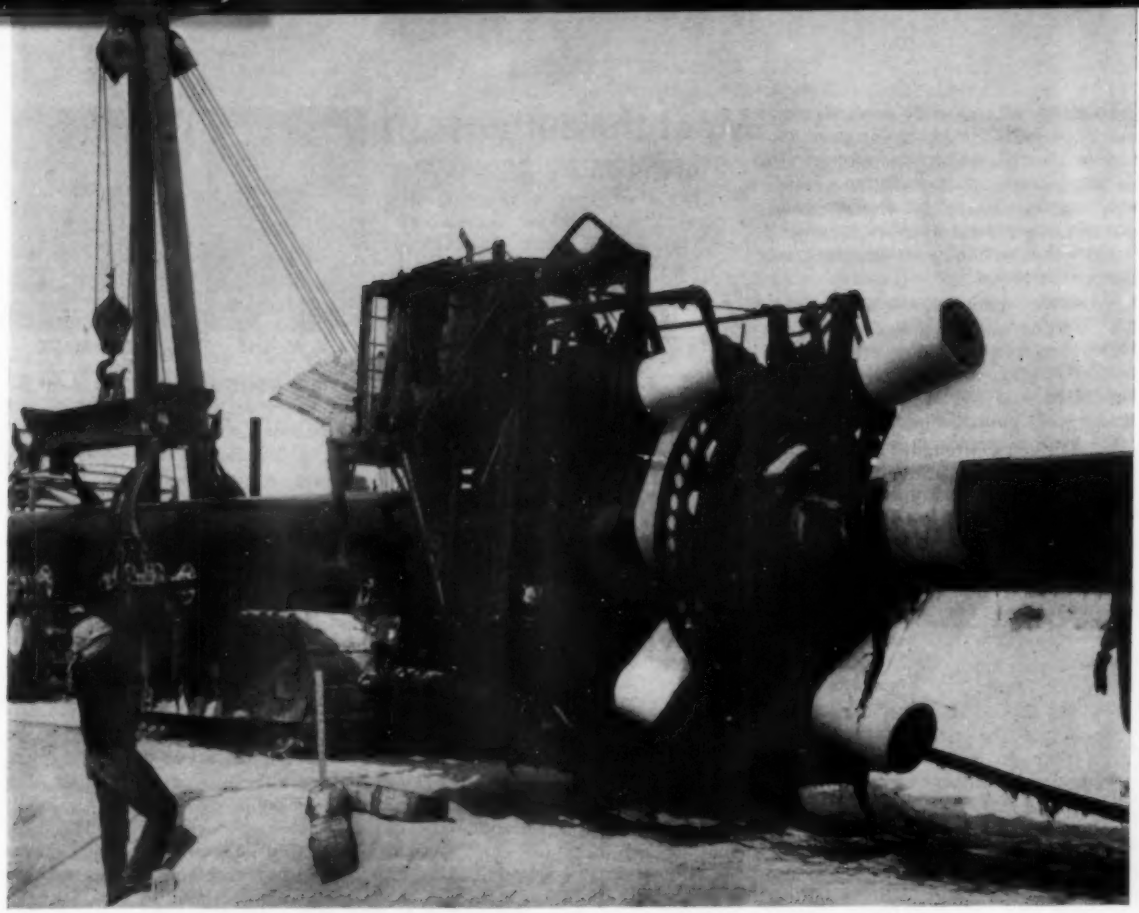


COATING PROTECTS Aramco line from corrosion resulting from salt water in this region on the Persian Gulf Coast.

Protective coatings for buried pipelines

Because of the low cost, local availability, and generally acceptable properties, the authors believe asphalt will continue to be used for coating of Aramco pipelines in Saudi Arabia. Coal-tar enamel coating might be justified in areas of extremely low or widely varying soil resistivity and in oil-soaked areas. Polyethylene tape appears to have many desirable properties and a reasonable installed cost. Consequently, Aramco plans a full-scale evaluation of this product.

BY V. MITCHELL LISS AND PAUL FETKO
Arabian American Oil Co.

MORE THAN 600 miles of buried pipelines have been built by Arabian American Oil Co. in Saudi Arabia. The lines pass through sandy and rocky terrain as well as through moist salt flats. Soil resistivity in these areas varies from 2,000 to 180,000 ohm-cm.

To protect these pipelines from corrosion, Aramco has used asphalt, a locally available product of the Ras Tanura refinery. In Aramco's particular case, asphalt was used because Aramco is a producer of asphalt.

But, since there are many factors other than cost involved in choosing a coating, presently available coatings were investigated to determine whether asphalt should continue to be used. These fundamentals of coating evaluation are included here to assist the reader in preparing his own economic development for coatings that he may be considering.

Coating Properties

Basically, the desirable characteristics of an effective coating are those which provide complete and permanent isolation of pipe and corrosive elements. These characteristics are as follows:

... **Chemical resistance.** The coating should be inherently stable, insoluble in petroleum products, and chemically inactive with pipe metals, soil, air, water, bacteria, and local vegetation.

... **Physical resistance.** The coat-

ing should adhere at all times to the metal it is intended to protect. It should also be able to resist physical damage during transportation, storage, and installation and to withstand pressure, temperature, soil, and similar stresses that normally cause deformation or deflection.

. . . Water - penetration resistance. The coating should provide a complete barrier against the penetration of water. Maximum water absorption should be 0.25% by weight of moisture in an exposure time of 250 days.

. . . Dielectric strength. The coating should act as an insulator between the pipe and the adjacent soil or water in order to prevent electrochemical corrosion of the pipe. It should have a sustained electrical resistance of 100,000 ohms per square foot of surface.

. . . General. The coating should have high mechanical and bond strength, durability, and reasonable cost, and should resist bacteria, vegetation, and the effects of cathodic protection. In addition, the coating should be relatively easy to apply both in a plant and under field conditions.

The properties of some of the coatings under present investigation are tabulated in Table 1. This information was compiled by W. H. Cates and published in the February 1953 issue of the American Water Works Association's Journal. The data as presented by Cates indicate that the chemical resistance, water-penetration resistance, dielectric resistance, and durability properties of coal-tar enamel are better than those of asphalt enamel.

It is a recognized and accepted fact that the chemical, physical, and soil-stress resistances of asphalt are only fair. But, on the other hand, coal tar also has only fair physical and soil-stress resistance. These deficiencies can be very serious if the terrain is unusually rough or if the personnel are inexperienced.

However, if coal-tar-coated pipelines can be placed safely in the ground, the high durability of this coating can be of great benefit. For example, coal tar can be used advantageously in areas of extremely low soil resistivity or in sand that is oil saturated. Coal tar should also be considered for areas where the pipeline may be adjacent to another with bad leak history. Frequent leaks of petroleum products would undoubtedly destroy an asphalt coating, whereas a coal-tar coating might hold up in this environment.

Of course deficiencies in coatings are somewhat overcome by the type and number of wrappings used. Typical characteristics of common wrappings are listed in Table 2.

Meet the authors . . .

V. M. LISS

PAUL FETKO

V. Mitchell Liss is a section head in Aramco's New York engineering department. He graduated with honors from South Dakota School of Mines and Technology in 1947 with a B.S. degree in chemical engineering. Joining Aramco in 1948, he served in the Ras Tanura refinery and Dhahran oil operations in Saudi Arabia as a process engineer. He was transferred to New York in 1951 and headed the pipelines and utilities section of the production and pipelines department until his transfer to the engineering department in 1956.

Paul Fetko is currently on leave of absence from Aramco, studying at Harvard Graduate School of Business Administration. He graduated from the United States Military Academy in 1955 with a B.S. degree in military engineering. As an engineer in Aramco's Technical Services Division in New York, Fetko has been active in pipeline corrosion studies.

DITCH CONDITIONS were ideal in sandy region on Safaniya-Ras Tanura pipeline.

Table 1—Pipeline-Coating Properties

	ASPHALT DIP	ASPHALT EMULSIONS	ASPHALT ENAMEL	ASPHALT MASTIC	COAL TAR ENAMEL	MORTAR	PETROLATUM	VITREOUS ENAMEL	SYNTHETIC RESINS (PLASTICS)	RUBBER	METALLICS	PAINTS
CHEMICAL RESISTANCE	FAIR	LOW	FAIR	FAIR	HIGH	FAIR	FAIR	HIGH	HIGH	HIGH	FAIR	FAIR
PHYSICAL RESISTANCE	FAIR	LOW	FAIR	HIGH	FAIR	HIGH	LOW	FAIR	HIGH	FAIR	FAIR	FAIR
WATER PENETRATION RESISTANCE	LOW	LOW	LOW	FAIR	HIGH	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	LOW
DIELECTRIC RESISTANCE	LOW	LOW	FAIR	FAIR	HIGH	FAIR	LOW	HIGH	HIGH	HIGH	LOW	LOW
SOIL STRESS RESISTANCE	FAIR	LOW	FAIR	HIGH	FAIR	HIGH	LOW	HIGH	HIGH	FAIR	HIGH	FAIR
DURABILITY	FAIR	LOW	FAIR	HIGH	HIGH	HIGH	LOW	HIGH	HIGH	HIGH	HIGH	FAIR
PSI BOND STRENGTH	100	LOW	150	FAIR	150	LOW	LOW	3000	HIGH	500	HIGH	FAIR
DUCTILITY	FAIR	FAIR	FAIR	FAIR	HIGH	LOW	FAIR	FAIR	HIGH	HIGH	HIGH	FAIR
°F FLOW TEMPERATURE	150	100	160	220	160		80	1000	150			100
EASE OF APPLICATION	HIGH	HIGH	FAIR	HIGH	FAIR	FAIR	HIGH	LOW	FAIR	FAIR	HIGH	HIGH
APPROXIMATE THICKNESS (IN)	1/8	0.065	3/32	1/2	3/32	3/4	1/10	1/32	0.006	3/16	0.006	0.006
ABRASION RESISTANCE	FAIR	LOW	FAIR	HIGH	HIGH	HIGH	LOW	HIGH	HIGH	HIGH	HIGH	FAIR
DEFLECTION RESISTANCE	HIGH	HIGH	HIGH	FAIR	HIGH	LOW	HIGH	LOW	HIGH	HIGH	HIGH	HIGH
POROSITY	FAIR	HIGH	LOW	FAIR	LOW	HIGH	FAIR	FAIR	LOW	LOW	FAIR	HIGH

Comparative Performance

Although the authors know of no reliable published comparison made between P-2 (double coat-double wrap) coatings using coal tar and asphalt, experience tends to show that in actual use there is no marked difference in performance. Eight years ago another major oil company installed two equivalent test pipelines, one coated with mineral-filled coal-tar compound and the other with a three penetration at 77° F. (230° softening point) asphalt, on an experimental basis.

At the latest report neither pipeline has shown superiority over the other. In the opinion of the company testing these two coatings, asphalt is as good as coal tar in all cases except when asphalt is in contact with other petroleum products. Petroleum asphalts are usually completely soluble in hydrocarbon, whereas coal-tar bitumens are only partly soluble in these materials.

TABLE 2—CHARACTERISTICS OF PIPE-WRAPPING MATERIALS

Materials—	Chemical resistance	Physical resistance	Water-penetration resistance	Dielectric strength	Soil-stress resistance	Durability
Asbestos felt	High	Fair	High	High	Fair	High
Fiber glass	High	High	High	High	High	High
Plastic tape	High	High	High	High	High	High

TABLE 3—CHARACTERISTICS OF PRESSURE-SENSITIVE TAPES

Backing material—	Polyvinyl	Polyethylene
Over-all thickness (mils)	10	12
Adhesion to steel (oz./in. width)	30	48
Tensile strength (lb./in. width)	25	25
Water vapor transmission rate (g./100 sq. in.)	1.55	0.20
Moisture-absorption rate (per cent)	0.19	0.02
Dielectric strength (volts)	9,500	14,000
Insulation resistance (megohms) (ASTM-D257)	500,000	1,000,000

Asphalt-Mastic Coating

An asphalt-mastic type of coating is a fairly thick coating (½-in.) consisting of an asphalt and filler that are applied on the pipeline under pressure and then cooled. Table 1 indicates that an asphalt-mastic type of coating has high physical resistance and high soil-stress resistance.

In the field, where a coating gets rough handling by heavy equipment and where poor ditching operations are not unusual, these properties are extremely attractive. However, the current method of asphalt-mastic use entails setting up an expensive plant to do the coating. So the above-mentioned characteristics are presently outweighed on the basis of installed cost (including plant amortization) and on the complexity involved in plant coating and pipe and field coating the welded portions of plant-coated pipes.

But the installed cost would not be a disadvantage if mastic were used on an extremely large scale, and the complexity of operations would not be a problem if the mastic could be applied in an over-the-trench manner. Overcoming of these features would tend to make asphalt-mastic more competitive with asphalt provided a suitable mastic can be made under Aramco conditions with Saudi Arabian sand. These points have not been fully resolved yet, but will continue to be investigated as desirable information.

Plastic and Other Tapes

Of the three main types of tape available, a coal-tar tape is the only one that is applied hot. This coating must be heated with a torch to soften its bituminous components before the tape can be applied. Although coal-tar tape provides an extremely impervious coating, its high cost and difficulty of application are disadvantages that make it undesirable for field operations.

Polyvinyl chloride and polyethylene tape, on the other hand, are cold applied tapes that can be either hand or machine wrapped. Among the outstanding advantages of these pressure-sensitive tapes are high application rate, low labor requirements, cleanliness of operations, and low wastage

under normal conditions. Polyethylene tape, in particular, can supposedly be applied directly over cleaned new pipe without requiring a primer to get proper tape to metal bond.

The adhesive is reported to be of sufficient thickness to fill up small pock marks in the pipe exterior and the tape itself is flexible enough to conform to unevenness of metal surface. Polyethylene tape is claimed to have performance characteristics that are equivalent to those of polyvinyl chloride tapes. Table 3 shows how polyethylene tape compares with polyvinyl chloride tape.

Pressure-sensitive tapes are normally applied with about ½-in. overlap. Simple adjustment of the wrapping machine can set different overlaps, which in turn provide double thickness if the overlap is half the tape width, etc. This feature can be advantageous when wrapping corners or when wrapping in an area that is expected to be extremely hard on a coating.

Normally, the pipe can be wrapped with minimum overlap and still be comparatively well protected against corrosion. Tape wrapping that is done in accordance with the vendors' instructions is claimed to require very little cathodic protection.

It is claimed by a supplier that a polyethylene - tape - wrapped pipeline with an outer protective layer of conventional glass, asbestos, or kraft wrap (to protect the tape during ditching) is equivalent to the standard asphalt or coal tar P-2 wrap.

Adhesive breakdown does occur in the immediate vicinity of a leak, but this is reported not to materially affect the coating envelope. It is claimed that in no case will the adhesive breakdown be propagated along the pipeline. In view of the increasing use of tapes for pipeline coating service, Aramco plans to test wrap approximately 28,000 ft. of 14-in. transfer line with polyethylene tape to determine whether the manufacturer's claims as stated above are valid under Arabian service conditions. Remaining half of this transfer line will be asphalt P-2 coated for comparison purposes.

First composite tree

is installed on Texas producer in the field

BY ED McGHEE
District Editor

THIS YEAR saw the first unitized christmas tree to be installed on a producing well in the field.

Owner of the well is V. F. Neuhas, independent operator of Mission. Tex. The tree was installed on Neuhas' A-1 Dan Cameron well in Starr County, Texas, on January 4, 1958 (Fig. 1).

The tree is Cameron Iron Works' 5,000 - psi. working - pressure "composite tree." It contains flow tee, wing valve, and master valve all in a single forged piece. Master valve and wing valve are both Cameron's new Type F (OGJ, May 5, 1958, p. 152). Casing-wing valve is also a Type F but is of conventional flanged-end construction.

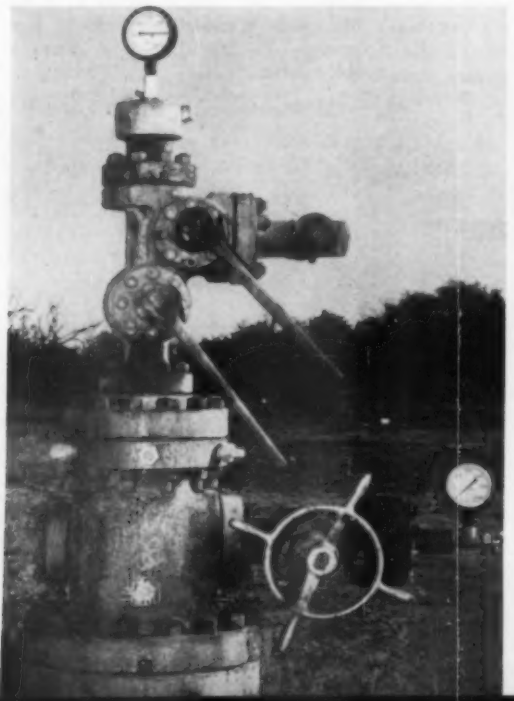
The Neuhas well is a gas producer and has a shut-in tubing-head pressure of 2,800 psi.; it is awaiting a pipeline connection.

Saves space, connections . . . One of the biggest advantages of the composite tree is that it eliminates flanged connections between the flow tee and the master and wing valves. Of course, each flanged connection eliminated is a possible source of leakage and trouble eliminated.

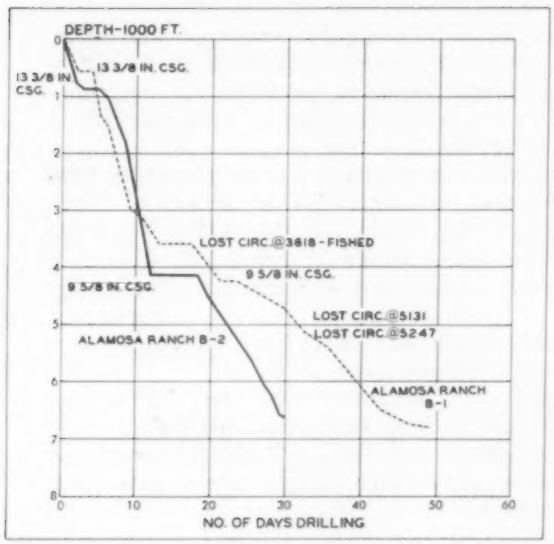
Also, as a result of combining several parts into one, the over-all tree is lighter in weight and more compact in size. It should be easier and simpler to stock, handle, and install.

Dual trees, too . . . Cameron Iron Works has already applied the principle of the composite tree to dually completed wellheads. Fig. 2 shows a dual tree now available for use. It, like the single tree in Fig. 1, has the new Type F valves. However, the master valves and wing valves for each tubing string is combined into a single piece. This arrangement saves four flanged connections and greatly reduces the width and weight of the composite tree as compared to a conventional-design tree.

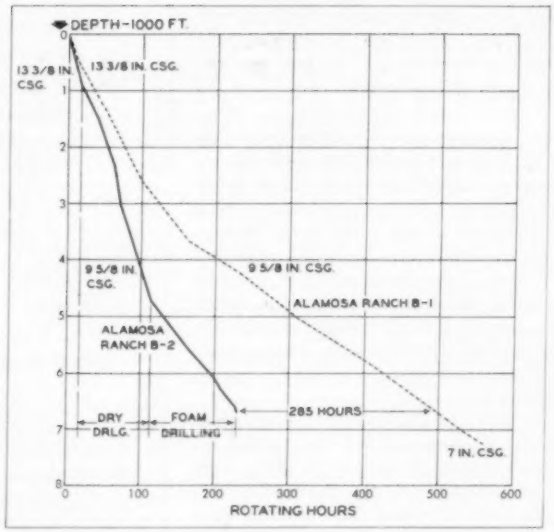
THE FIRST composite christmas tree ever to be installed on a producing well in the field was set up in Texas this year. Fig. 1.



PRINCIPLE of the composite tree was used to produce a dual-completion tree with master valves and wing valves for each tubing string combined into a single piece. Fig. 2.



Fewer drilling days . . .



and a shorter rotating time while air-drilling at a Texas drill site indicate that . . .

Foaming agents lick water-zone slowdowns

R. M. REED
Shell Oil Co., Tulsa

THE PALO DURO basin of the Texas Panhandle is an area where lost circulation has proved to be the principal problem in drilling. Lightweight 40% oil-emulsion muds, batch treating of losses with heavy concentrations of lost-circulation material, and careful rig operating techniques have all been used with only limited success. Severe and recurring lost circulation continues to result in high mud costs and slow drilling progress. As a further attempt to solve these related problems, air was chosen as the circulating medium for Shell-Alamosa Ranch "B" 2 well in Oldham County, Texas. In a mud-drilled offset, Shell-Alamosa Ranch "B" 1, serious loss of circulation occurred three times and resulted in one costly fishing job.

Where water-bearing formations are encountered, air drilling is usually abandoned in favor of conventional drilling methods. Damp or weeping zones cause balling up of cuttings and present the danger of stuck drill pipe. Periodic slugging with water to flush the hole has sometimes been useful to control this condition. Larger flows of formation water have been handled where adequate compressor capacity is available and if exposed formations do not slough in the presence of water. Drilling progress suffers under either condition, however, principally because of time-consuming operational procedures found necessary in handling water influx.

Presented at the spring meeting of the Mid-Continent District Division of Production, Oklahoma City, April 1958.

Preliminary studies, based on logs of nearby wells, indicated the probability of encountering sizable water flows in Alamosa Ranch "B" 2 in the Wolfcampian series of Permian age; damp zones were expected at shallower depths. The use of foam offered promise of relieving water-handling problems through increases in lift efficiency and aeration of the circulating system. For this reason experiments in the use of foaming agents were planned and conducted during the air-drilling of this well.

Surface hole . . . The 12¼-in. surface hole was drilled to 900 ft. with mud and logged to insure that all surface-water sands had been penetrated. After reaming to 17¼ in., 12⅜-in. casing was cemented at 851 ft.

Intermediate hole . . . After unloading water from the surface casing, drying the hole and drilling the plug, cement and shoe, the hole was flushed clean with foaming agent and redried. The 12¼-in. hole from 900 ft. to the intermediate casing point at 4,177 ft. was drilled dry through shale, anhydrite, salt, and dolomite. This section included the Permian red beds.

Two damp zones were drilled, one at 2,013 ft. and the other at 3,751 ft. In the top zone, the hole continued to dust, but the returns were damp. It was necessary to rotate and circulate out of the hole on a trip at 2,441 ft. At 3,751 ft. most of the dust returns were lost, but after circulating for 45 minutes and drilling 15 ft., full dust returns were regained. On the next trip at 4,177 ft. over 15 hours were required to get out of the hole. In both cases cutting accumulation on the drill pipe and on the wall of the hole through the wet formation caused the difficulty. Water and foam injection was not initiated in an effort to clean the hole because of the exposed bentonite shale zones.

From 900 to 2,770 ft., the air-circulation rate was maintained at 2,100 cu. ft. per minute. At 2,770 ft. an additional compressor was installed to give 2,850 cu. ft. per minute total

capacity. Equivalent annular velocity then increased from 2,980 to 3,850 ft. per minute and average penetration rate increased from 400 to 610 ft. per day. An immediate penetration-rate increase from 55 ft. to 73 ft. per rotating hour was noted.

Air drilling, dry . . . The hole was "mudded up" at 4,177 ft. and 9⅝-in. casing was cemented at 4,174 ft. After conducting various tests with foaming agents in the cased hole, cement was drilled, the hole dried and dry drilling commenced. At 4,612 ft., dust returns became damp; and by 4,627 ft., all dust returns were lost. In attempting to dry the hole, drilling continued to 4,734 ft. without cutting returns.

A trip at this depth was trouble-free, but wet cuttings were found on the bottom 15 stands of drill pipe. Attempts to dry the hole after this trip were fruitless and drilling proceeded with the injection of water and foaming agent to remove cuttings. Air circulation was maintained at 2,100 cu. ft. per minute through this interval with an equivalent annular velocity of 4,700 ft. per minute.

Air drilling, foam . . . The entire 1,965-ft. interval was drilled while maintaining a continuous injection of water and foaming agent. Formation-water influx varied from 1 to 50-60 bbl. per hour. Injection rates varied from 1½ to 12 bbl. of water per hour with from 1 to 6½ gal. of foaming agent. Best results were obtained at a continuous injection rate of approximately 4 bbl. of water per hour, with foaming-agent amounts varied to suit conditions. A further discussion of these conditions will follow later.

Formations drilled included hard shale, dolomite, and limestone with some chert. Considerable gage trouble and short bit life were experienced with W7R-type bits commencing at about 5,000 ft. RG-1J bits proved an adequate solution to this problem and three of these bits were used in completing the air-drilled interval.

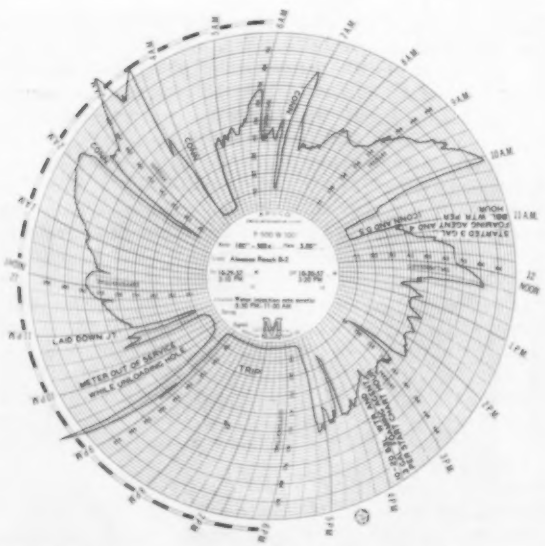
When starting out of the hole at 6,241 ft., the drill pipe stuck 25 ft. off bottom. Five gallons of foaming agent with water were batched into the hole and pipe was free after circulating air for 20 minutes. No further trouble was experienced on this trip. Either 1,400 or 2,100 cu. ft. per minute of air was utilized, depending upon the pressure requirements. (Pressures above 250 psi. required the use of a booster compressor which would handle only 1,400 cu. ft. per minute.) At 6,699 ft. the hole was mudded up to core the two objective zones and drilling continued with mud to a total depth of 7,740 ft.

The average daily penetration rate through the entire air-drilled interval was equal to 162% of mud-drilled well. It is interesting to note that while only 43% as many rotating hours were required in the air-drilled well, 62%

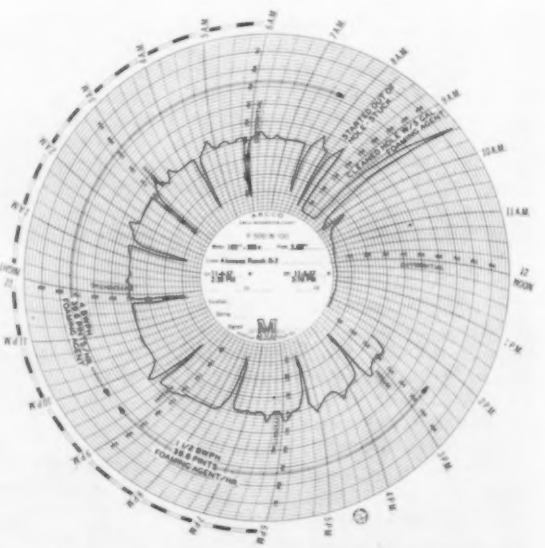
The author says . . .

Conclusions drawn from limited experience with foaming agents in one well are certainly subjected to later verification or possible change. However, the following conclusions were indicated by the experimental use of these materials in Alamosa Ranch "B" 2:

1. Operationally, it is possible to handle large water flows successfully with foaming agents while air drilling.
2. Economically, the amount of water influx which can be tolerated while foam drilling is limited by the cost of the foaming agents and the reduced penetration-rate advantage over mud.
3. Use of foaming agents reduces the circulating pressure requirements while handling water influx.
4. Penetration rates are slower with foam drilling than with dry drilling, but both are faster than mud drilling.
5. Unless inhibitors are used, drill-pipe corrosion can become a problem, even while using saturated lime water for injection purposes.



VARYING water-injection rates in foam drilling result in these air-supply pressure conditions.



CONSTANT water-injection rates in foam drilling result in these air-supply pressure conditions.

as many total days were required. This variance is explained, at least in part, by the amount of time spent in conducting special tests, training crews, and developing suitable operating techniques.

Dry drilling proved to be faster than foam drilling. In comparable hard limestone intervals, penetration rate while drilling was 149% faster than while drilling with foam. This result was not unexpected because of increased bottom-hole pressures while handling sizable water flows. Foam drilling, however, was still 60% faster than mud drilling.

Equipment, Materials, Techniqes

Foam drilling . . . Maintenance of constant injection rates was found to be necessary for optimum foam-drilling conditions. Varying injection rates resulted in large, hard-to-manage heads of fluid and caused wide ranges of pressure variation. Under these erratic conditions, drilling rates slowed at pressure peaks and circulation through the bit was cyclic. Poor circulation-rate stability proved detrimental to bit bearing life unless drilling was stopped during periods of low or no circulation.

As an example of the pressure conditions under poor injection conditions at 5,000 ft., surface pressures continually varied from 170 to over 500 psi. At this time a small air-operated boiler feed pump was installed and a constant injection rate was initiated. Pressures immediately leveled off at 190 to 200 psi. with occasional small fluid heads requiring only about 240 psi.

Various attempts were made to establish the amount of foaming agent necessary for optimum drilling conditions. The concentration recommended by the manufacturer was 1 pt. of the agent per barrel of total water being handled, or approximately 0.3% by volume. Laboratory tests indicate that good foam is created with somewhat smaller concentrations. In actual practice it is difficult to know the exact amount of water being handled at any one time. However, adjusting the concentration of foaming agent to obtain the most nearly stable surface pressure conditions possible proved a practical procedure.

Bits . . . A total of 12 bits was used in the air-drilled interval in Alamosa Ranch "B" 2 compared to 35 in the same interval in Alamosa Ranch "B" 1. Average footage per bit figures were 482 vs. 166. The maximum footage with one bit while air drilling was 1,736 ft. through an interval where bits used in offsetting well averaged 230 ft. Gage wear on standard bit types became a serious problem at about 5,000 ft.

One H7L bit made only 117 ft., the W7R bit following it reamed nearly 60 ft. and made only 23 ft. of new hole, and the following W7R reamed 23 ft. and made no new hole. An RG-1J bit run at 5,087 ft. made 493 ft. of gage hole. Two more of these bits were used in finishing the air-drilled interval with runs of 661 ft. and 456 ft. through hard shale and limestone.

Corrosion inhibition . . . All water used for injection purposes was lime water with a pH of 12 to 13 to inhibit corrosion. Because of the small amount injected as compared to the formation-water flow, pH of returned water at the blooie line was only 7. Intensive slugging with lime to provide an excess was successful in raising terminal pH to 8.5 at one time. Minor pitting of the bottom 2,700 ft. of drill pipe was noticed after 7 days of foam drilling. Neither the drill collars nor the tool joints showed any evidence of corrosion. On the next trip into the hole, the bottom 30 stands were swabbed with a solution of an organic inhibitor.

The same inhibitor was mixed with the injection water to provide 50 p.p.m. concentration with total water in the hole. Although pilot tests at this concentration showed no noticeable effect on the action of the foaming agent, introduction of the material into the circulation system suppressed all foam. It was necessary to cease injection of this inhibitor immediately and dispose of all contaminated injection water. After swabbing the drill pipe with inhibitor no further external corrosion was noted during the final 3 days of foam drilling.

Samples . . . Cutting-size distribution ranged from dust to particles approximately ¼-in. in diameter. While dry drilling, dust-size returns were predominant with air volumes of 2,100 cu. ft. per minute in the 12¼-in. hole. After installing additional compressor capacity, larger particles were returned, as large as ⅛-in. in diameter. Lag time was negligible while dry drilling.

Foam drilling resulted in larger cuttings, as large as ¼ in. in diameter, and pieces of cavings ½ in. in diameter were noted from time to time. Lag time became somewhat of a problem, because of heading conditions. Even with the best-obtainable pressure characteristics, small irregularly timed fluid heads were noted, and cuttings were carried in great quantity by these heads. At times few cuttings were returned between heads.

Hole deviation . . . No trouble with excessive hole deviation was experienced as is sometimes the case in air drilling. Deviation was about equal to the offsetting Alamosa Ranch "B" 1 and never exceeded 2°. Bit weights were of the same order of magnitude in both wells, i.e., 20,000 to 35,000 lb.

Equipment . . . Compressors used on Alamosa Ranch "B" 2 were company owned equipment with a rated capacity of 2,100 cu. ft. per minute at 250 psi. Booster equipment was rated for 1,400 cu. ft. per minute at 1,500 psi. A 4-in. by 1¾-in. by 4-in. boiler-feed pump (driven by air from the supply line) was used to inject water. Foaming agent was introduced at first through a lubricator into the suction of the water-injection pump and later into the discharge by means of two ⅞-in. by 4-in. chemical feed pumps. Use of the lubricator was abandoned because of the difficulty of maintaining an even injection rate.

Metering equipment consisted of temperature recorders on the air-input line and the blooie line, together with an orifice meter to record air volumes.

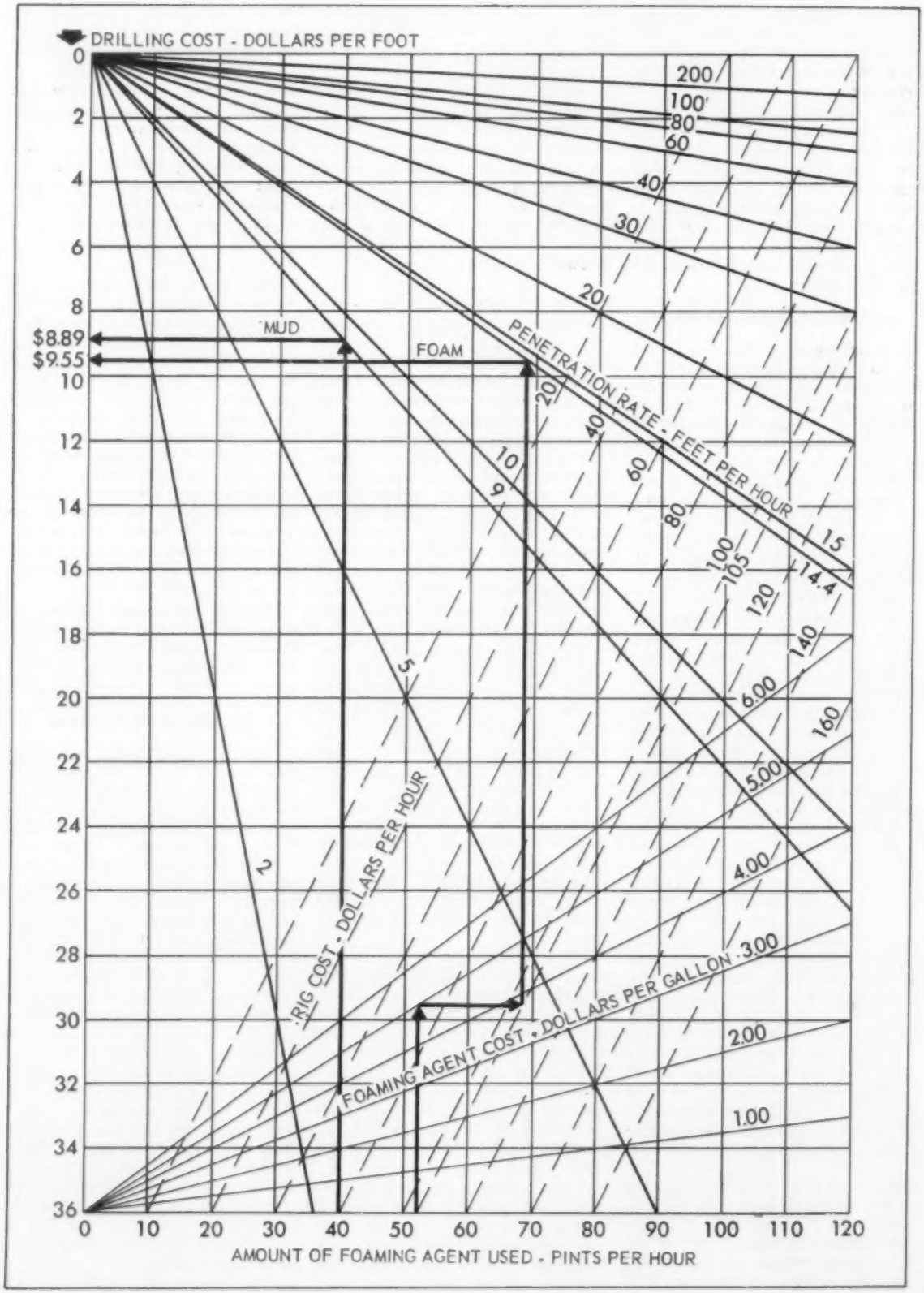
Economy of Foam Drilling

Considerable amounts of water were handled successfully while drilling with foam in Alamosa Ranch "B" 2. The high cost of the foaming agents, however, makes the economies of this technique appear questionable where large amounts of water are encountered, and where lost circulation is not considered. As an example, while handling 50 to 60 bbl. of water per hour, 6½ gal. per hour of foaming agent were added at a cost of slightly over $5 per gallon.

On these peak days, over $500 was spent for foaming agents or more than the normal cost for mud maintenance on a mud-drilled well.

Normal mud drilling of one interval in Alamosa Ranch "B" 1 with a rig costing $80 per rotating hour and a penetration rate of 9 ft. per rotating hour gave a cost per foot of $8.89. While foam drilling this same interval in Alamosa Ranch "B" 2, the same rig, with compressors added, cost $105 per rotating hour, and made 14.4 ft. per rotating hour while using 52 pt. of foaming agent.

The cost per foot in this case was $9.55, or 66 cents per foot higher than the cost of mud drilling. Had



FOAM-DRILLING economics can be determined by this chart.

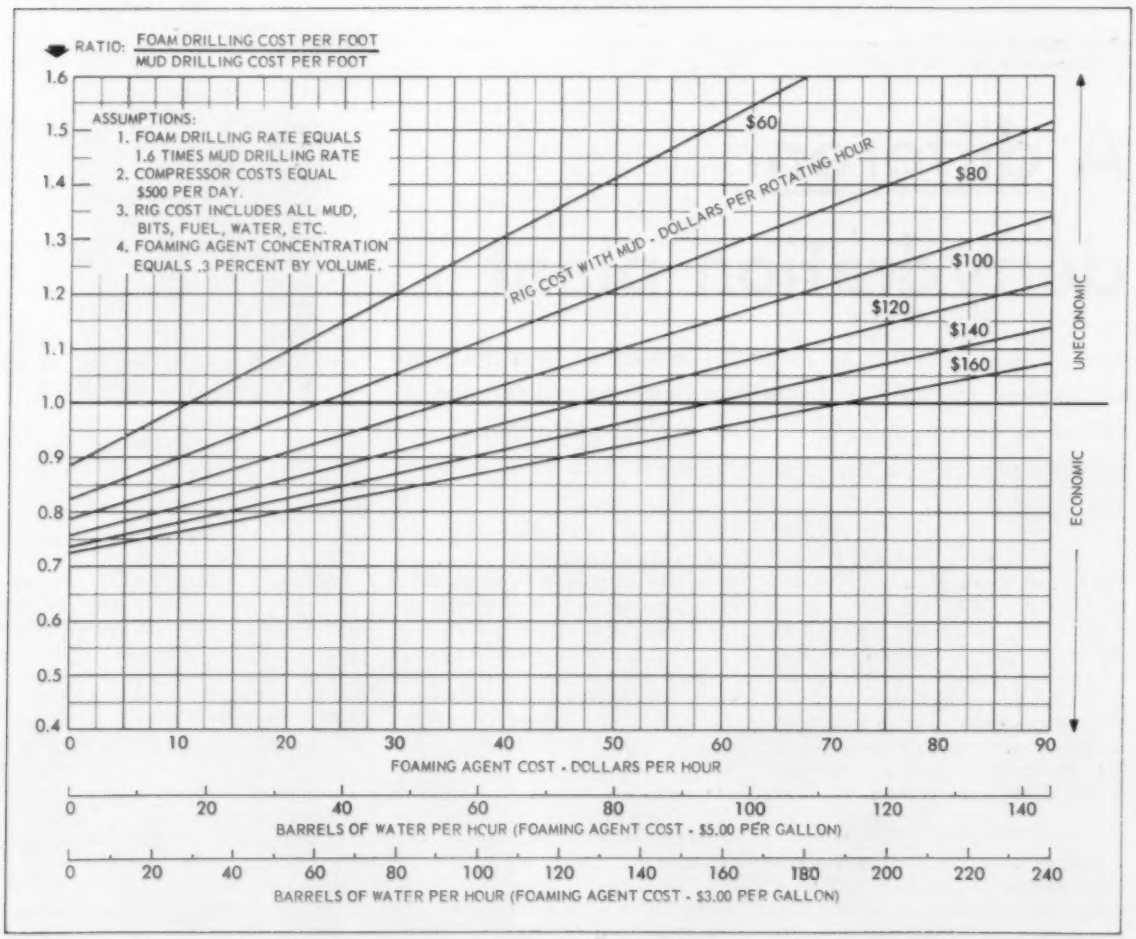
lost circulation not been a factor, the economic limit for foam drilling would have been exceeded at this rate of foam injection. In the offsetting well, however, rig time and mud lost while fighting lost circulation averaged $1.40 per foot, giving foam drilling an apparent advantage of 74 cents per foot in this interval.

To summarize, the use of foaming agents is one way to solve the problem of water influx in air drilling. The best solution to this problem is, of course, the most economical one. Development of adequate and economical methods of water shutoff would perhaps be the most desirable solution, however, a lot could be done toward improving the economics of foam drilling by simply developing cheaper foaming agents. In the meantime, the use of foaming agents should extend the application of air drilling and the additional experience gained will, no doubt, permit greater savings to be made than were possible on this early experimental well.

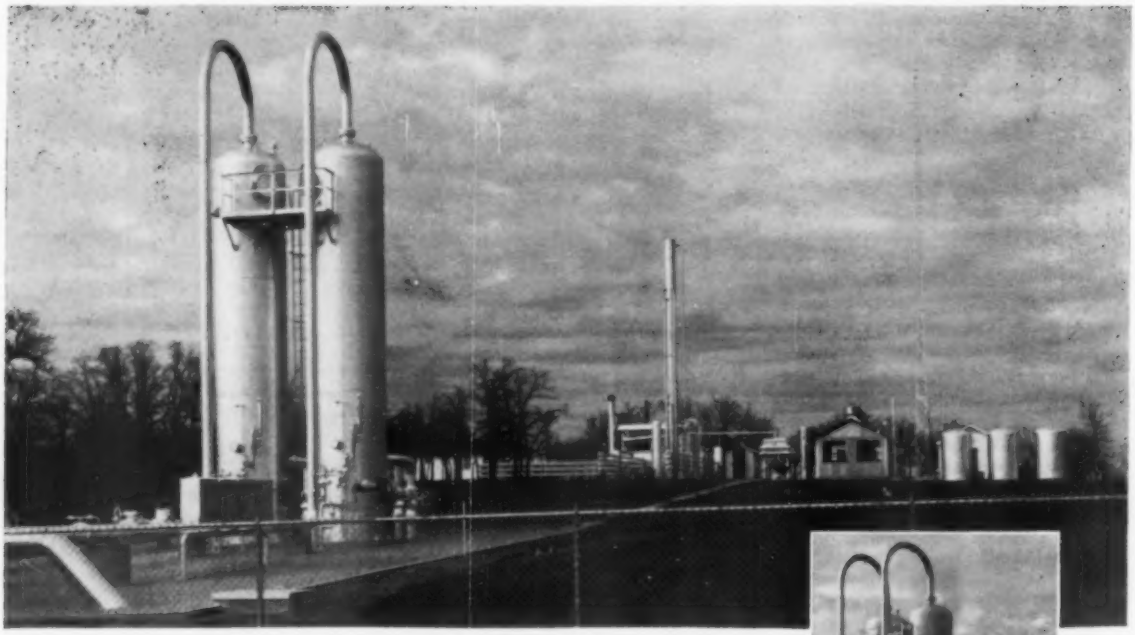
DRILLING PERFORMANCE COMPARISON, ALAMOSA RANCH

Item—	B-1 (mud)	B-2 (air)	B-2 (air) as % B-1 (mud)
Dry drilling 12¼-in. hole 900-4,177 ft.—			
Ft. per day, av.	205	468	229
Ft. per bit, av.	273	819	300
Bits	12	4	33
Rotating hours	208¼	79¼	38
Feet per rotating hour, av.	15.8	41.5	262
Total days	16	7	44
Dry drilling 8⅝-in. hole 4,177-4,734 ft.—			
Ft. per day, av.	86	279	324
Ft. per bit, av.	93	557	600
Bits	6	1	17
Rotating hours	62¼	11	18
Ft. per rotating hour, av.	9.0	50.6	563
Total days*	6½	2	31
Foam drilling 8⅝-in. hole 4,734-6,699 ft.—			
Ft. per day, av.	123	197	160
Ft. per bit, av.	115	281	245
Bits	17	7	41
Rotating hours	223½	120	54
Ft. per rotating hour, av.	8.8	16.4	186
Total days	16	10	63

*Does not include running 9⅝-in. casing in either well or mudding up in B-2 for casing—total of 6 days in B-2, 2 days in B-1.


RATIO: FOAM DRILLING COST PER FOOT / MUD DRILLING COST PER FOOT
ASSUMPTIONS:
1. FOAM DRILLING RATE EQUALS 1.6 TIMES MUD DRILLING RATE
2. COMPRESSOR COSTS EQUAL $500 PER DAY.
3. RIG COST INCLUDES ALL MUD, BITS, FUEL, WATER, ETC.
4. FOAMING AGENT CONCENTRATION EQUALS .3 PERCENT BY VOLUME.
RIG COST WITH MUD - DOLLARS PER ROTATING HOUR
$60
$80
$100
$120
$140
$160
UNECONOMIC
ECONOMIC
FOAMING AGENT COST - DOLLARS PER HOUR
BARRELS OF WATER PER HOUR (FOAMING AGENT COST - $5.00 PER GALLON)
BARRELS OF WATER PER HOUR (FOAMING AGENT COST - $3.00 PER GALLON)

ECONOMIC LIMITS for foam drilling.



LONE STAR'S North Doyle gas-dehydration plant in southern Oklahoma. Twin contactors are seen in foreground.

A different dehydration plant

. . . has demonstrated that the more economical triethylene glycol plant can be utilized for so-called marginal conditions. Its actual performance has substantiated the basic design figures.

BY F. ZAPFFE
Lone Star Gas Co.

A GLYCOL DEHYDRATION plant containing several unusual features has recently been placed on the line by Lone Star Gas Co.

The plant, designed to supply 7-lb. gas at 600 psig. to Natural Gas Pipe Line Co. of America, has the feature of being able to regenerate the glycol in an atmospheric pressure still. When needed, a vacuum flash tower can be put on stream to obtain additional higher glycol concentration.

Design Considerations

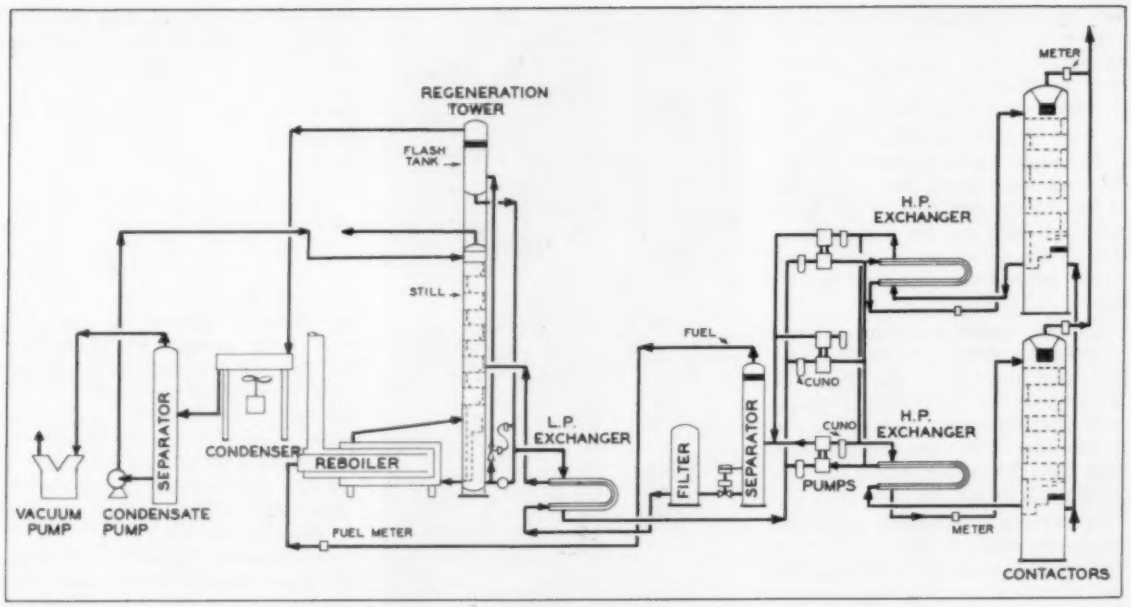
The contract with Natural Gas Pipe Line specifies a maximum of 7 lb. of water per million feet at operating pressures of 570 to 600 psig. A review of the situation showed that the 100,000 M.c.f. per day maximum gas volume, at the plant location, would normally flow at ground temperatures of 85° F. maximum in the summer and 45° F. minimum in the winter.

However, under abnormal conditions of reverse flow through Lone Star's main supply line, a number of gas sources that deliver at temperatures as high as 120° F., could raise the gas temperature at the dehydration plant site to well over 100° F.

The first impulse was that a dry-bed dehydration plant was in order. However, a closer study indicated that in normal operation, approximately 85 to 95 per cent of the time a well-designed conventional triethylene glycol plant with an atmospheric pressure regenerator would supply 7-lb. gas or lower. Such a conventional glycol plant can produce, dependably, 60° dew-point depression and with careful design and operation can approach 75° depression.

According to the Illinois Institute of Gas Technology Research Bulletin No. 8, the water content data most recently proposed to the industry as a tentative water content standard, the dew point of 7-lb. gas at the minimum operating pressure of 570 psig. is 23° F. Thus, at a conservative 60° depression of the dew point, a gas contactor temperature as high as 83° F. could dependably produce 7-lb. contract gas.

A conventional glycol plant in itself



A SIMPLIFIED FLOW DIAGRAM of the North Doyle dehydration plant of Lone Star Gas Co., Stephens County, Oklahoma.

would not suffice. An added measure of safety was required for the seasonal 85°, to possibly 100°, gas that could find its way into the plant. Because the glycol plant can be installed and operated for approximately half the investment and operating expense of the dry bed plant, further study of the glycol plant in the direction of vacuum regeneration was indicated.

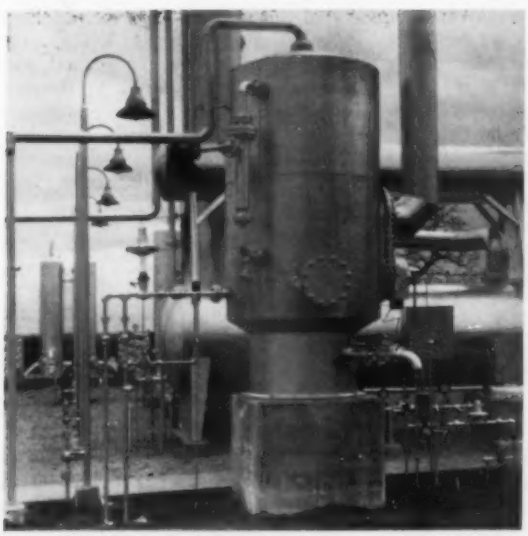
Vacuum regeneration . . . Vacuum glycol regeneration towers have been in use over 8 years with notable success. However, such plants usually operate with steam-type ejectors on the primary still to handle all hydrocarbon vapors as well as all water vapor. The operational benefits of such plants are beyond question. Triethylene glycol concentrations approaching 99.9 per cent are possible with dew-point depressions of over 100° being possible.

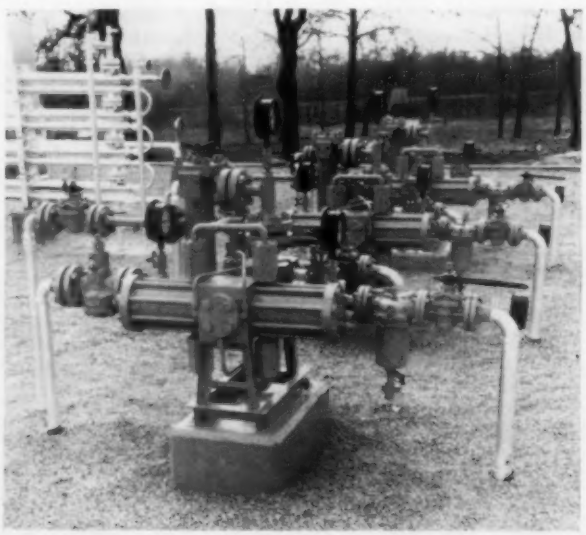
However, the location of the North Doyle dehydration plant is not adjacent to a supply of steam, such as at a gasoline plant, and would require an expensive steam plant to be used only for the estimated 5 to 15 per cent of the time. A more economical vacuum system was required for the intermittent service.

The design evolved consists of a 24-in.-diameter vacuum flash tank 12 ft. high, set, by means of an intervening skirt, 11½ ft. high, on top of the conventional atmospheric 10-bubble-tray still, which is 24 in. in diameter and 26 ft. high. The entire combined vessel is 50 ft. high from base to top seam.

How It Works

In conventional operation, the stripped glycol can flow from the surge tank in the bottom of the still to the heat exchangers and to the pumps. When vacuum service is required, a block valve is closed, the 375° to 400° glycol is drawn from





GLYCOL RECLAIMER, left, and three new-design Kimray pumps (right) in Lone Star's gas-dehydration plant.

the surge tank in the still base through a throttling flash valve up into the vacuum flash tank which is operated at 27 to 28-in. Hg vacuum to permit the excess water vapor and some small amounts of glycol vapor to flash off.

The more highly concentrated glycol then flows down the outlet pipe to the downstream side of the block valve and then into the heat exchangers at the same static pressure as would be available directly from the still.

The impossible sounding problem of causing a stream of glycol to leave the lower surge tank, rise nearly 40 ft. vertically and then return to ground level with the same static pressure as is available from the original surge tank can be accomplished by the mechanism of gas lift.

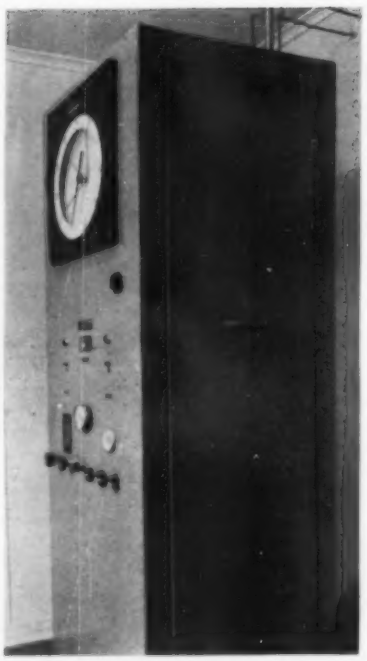
As the glycol leaves the surge tank at approximately 3 psig. and 375° F. and passes through the controlling motor valve into 27-in. Hg vacuum, the foam generated reduces the apparent density of the glycol to approximately one-third of that at 3 psig. and 375° F. The liquid level in the flash tank was so designed as to produce the same, or greater, hydrostatic head to the heat exchangers as would be available directly from the still surge tank.

The temperature in the flash tank will be less than that in the surge tank by the amount of latent heat required to flash off the amount of water that will vaporize. A nominal temperature drop of 25° can be expected.

Since the conventional still has removed all vapors at atmospheric pressure and 375° to 400° F., there are no noncondensable vapors to be handled by the vacuum flash tank. A small aerial cooling coil is designed to cool all vacuum flash overhead vapors to 120° F. maximum.

At 120° and 26-in. Hg vacuum all steam and glycol and most of the vaporized hydrocarbons will be condensed. Thus, the tailout vacuum pump needs to have a capacity to handle only a nominal volume of hydrocarbon vapors and any possible small air leaks.

Contactors . . . The two contactors are 72-in. i.d. by 29 ft. shell length with eight bubble cap trays on 24-in. spacing. An inlet separator, which occupies the lower 6 ft. of the shell, is provided with an internal float and distillate dump valve to protect the glycol from any possible contamination that might accidentally get into the main gas line. Between the separator and the glycol portion is a "chimney tray." The tray receives the glycol from the trays above while the chimney permits the gas to enter from the separator below.



DEW-POINT RECORDER in Lone Star's gas-dehydration plant.

The chimney contains an area of 8-in. thickness of York No. 326 wire mesh to stop distillate and water. This mesh is superior to usual meshes in that it is made of 0.006-in.-diameter wire rather than the usual 0.011-in.-diameter wire. The small mesh and small-diameter wire have a greater tendency to remove more of the smaller drops of liquid than the usual meshes.

A similar 8-in. pad of the same mesh is at the top of the vessel to minimize the glycol carryover from the vessel. The area of the mesh pads is approximately one-third that of the vessel cross-section area.

The contactors are connected in parallel to handle the 100,000 M.c.f.d. flow at 600 psig. normal pressure and 800 psig. maximum pressure. Gas meters are provided on the outlet of each contactor to balance gas flow.

Pumps . . . To simplify the lean glycol flow of 5 g.p.m. normal, 7.5 g.p.m. maximum, to each contactor, one pump is dedicated to each contactor with one spare between them. The glycol flow to each contactor is metered.

The pumps selected are of the new Kimray design. The design of the 40, 90 and 210-gal. per hour pumps has been field tested for nearly 2 years with improvements having been made during that time. The installation of the three 450-gal. per hour pumps at North Doyle was the first of that size. The pumps have been very successful in their operation. Two more plants are being designed around this pump. One plant will have two more 450-gal. per hour and another plant will have two 750-gal. per hour pumps.

The basic design of the pump consists of two pistons connected by one solid connecting rod in such a manner that wet glycol is introduced to the outer ends of the two pistons and dry glycol is pumped by the inner ends of the pistons. The diameter of the piston rod is such as to produce a piston area exposed to the dry glycol that is 0.8 times the area of the piston exposed to the wet glycol. The wet glycol is introduced alternately to the two outer ends of the pistons by novel slide valves that cannot lock on dead center.

In operation, the pump receives the dry glycol through check valves from the regeneration area at not more than 200° to 250° F. It is pumped through discharge check valves, through the high-pressure heat exchangers, to the contactor top tray. Wet glycol then flows from the bottom of the contactor, under full line pressure without any level control at the contactor, through the high-pressure heat exchanger to the wet ends of the pump.

Because the wet end of the pump is 25 per cent greater in area than the dry end of the pump, additional volume of fluid is required to make this "perpetual motion" pump operate. The absorbed water and dissolved gas and heavy hydrocarbons will add some volume to the liquid glycol and the additional volume of fluid required by the pump is supplied by associated gas.

The volume of associated gas required is dependent upon the absorber pressure, and the total friction drop of the glycol circuit. In general, the volume of gas required to operate the pump is approximately that required for reboiler fuel. Thus the pump, in addition to circulating the glycol, acts as a pressure-reducing regulator for the reboiler fuel.

Other Plant Components

Leaving either the surge tank in the still bottom or the flash tank outlet, as operating conditions dictate, the design dry glycol volume of 10 gal. per minute flows into the low-pressure bank of hairpin-type heat exchangers, wherein the temperature of the lean glycol is reduced to less than 200° F. From the shell side of the exchangers the glycol flows to a header that serves the three pumps previously described.

At this point, the lean glycol stream divides and one of two parallel

streams flows through a filter, through the lean side of a pump to a bank of high-pressure hairpin heat exchangers. This bank reduces the lean glycol to within 30° F. of the contactor and wet glycol temperature. From the heat exchanger the glycol is metered by an orifice-meter run and then flows to one of the two contactors. The other half of the divided glycol stream, through an identical set of equipment, flows to the other contactor.

Passing through the eight bubble-cap trays, the wet glycol returns from each of the two contactors in identical parallel streams through the tubes of a high-pressure heat exchanger, through another filter, to the wet-glycol side of the pump. The only pressure difference between the lean-glycol high-pressure pump discharge and the wet-glycol pump suction from the contactor is pressure drop in the lines, high-pressure heat exchanger, and hydrostatic head up to the top contactor tray.

The wet glycol from each of the two working pumps combines in a header to flow into a low-pressure separator. The associated gas, light hydrocarbon liquids, if any, and some water vapor flash off at 20 to 30-psig. pressure and 150° to 170° F. The gas is supplied to the reboiler and the glycol, through a level controller, flows to a sock-type full flow filter.

It then flows up through the tubes of the low-pressure heat exchanger to the feed tray of the still. Through the three lower trays, the glycol feed is conducted to the lower connection of an external, horizontal volume tank, thermosiphon-circulated, direct-fired reboiler.

The reboiler utilizes a standard oil-field-type fire tube in a special shell 4 ft. in diameter by 14 ft. long. The glycol enters at the 6-in. bottom connection from the still and flows through the 6-in. upper connection to complete the thermosiphon circuit through the downcomer duct inside the still surge chamber. A small gas-distributor pipe is located in the bottom of the reboiler to introduce small quantities of stripping gas to help concentrate the glycol.

An added feature of the plant is the glycol reclaimer that utilizes the vacuum condensing section when it is not used by the main plant. Continuous sidestream regeneration of the glycol from this plant or continuous feed of glycol from other plants is possible.

The vacuum pump is operated by a single-cylinder pumping engine. This engine also turns a hydraulic pump that, in turn, drives the aerial cooler fan and a small diaphragm-type condensate pump. This pump returns the condensed water from the flash tank to the still reflux, so that any small amounts of glycol in the condensate will not be lost to the system.

When reclaiming glycol from this plant, the condensate pump returns the clean glycol to the still feed tray. When reclaiming glycol from other plants, the discharge from the condensate pump is directed to a storage tank.

A Bureau of Mines dew-point recorder is installed to take sample from the plant outlet. An alarm circuit is provided on the recorder to alert the plant operator to an increasing dew point.

Summary

The actual performance of the plant has substantiated the basic design figures and has demonstrated that the more economical triethylene glycol plant can be utilized for so-called marginal conditions.

At the present time, with the vacuum system not in operation, the conventional still at 385° F., 6 to 8 g.p.m. plant circulation rate, contactors at 580 to 600 psig. and 48° F., and passing 80,000 M.c.f.d., the dew point ranges between —12° and —18° F., resulting in water contents of between 1.6 and 1.2 lb. of water per million.

On test runs, the vacuum system has demonstrated that it can dependably hold pressures to 27-in. Hg vacuum, which will be more than ample to provide 99.5 per cent TEG at 350° to 375° F. flash temperature. Glycol of 99.5 per cent concentration will provide the required +23° F. dew point at contactor temperatures as high as 120° F.

BOOKS

OIL DIRECTORY OF TEXAS FOR 1958. Published by R. W. Byram & Co., Drawer M, Capitol Station, Austin. $15. 327 pages.

The directory contains the names of only those companies and individuals who are actively engaged in producing, purchasing, or processing oil or gas in Texas.

"Its purpose is to supply the names of those people who are actually engaged in these phases of the oil and gas industry—not all of the companies who may be operating," the publishers explain. "The companies in this book own and operate the wells, or they buy the oil and gas."

The names were gathered from the state comptroller, so that each listing indicates an organization paying taxes to the state on its operation.

Covered in the directory are 6,578 oil-producing companies, 2,523 gas-producing firms, 73 refineries, 18 carbon-black plants, 168 oil-purchasing companies, 142 repressuring plants, 209 gasoline plants, 403 gas-purchasing companies and 28 cycling plants.

A typical listing includes the company name, address, teleghone number, and list of officers.

GEOLOGY AND GYPSUM RESOURCES OF THE CARTER AREA OKLAHOMA. By George L. Scott, Jr., and William E. Ham. Published by Oklahoma Geological Survey, Norman, Circ. 42, 64 pp.

The Oklahoma Geological Survey has published a report covering the surface geology of the Carter area that lies in Southwest Oklahoma at the junction of Beckham, Washita, Kiowa, and Greer counties. Although concerned mainly with the subsurface geology the area is of interest to oil finders in view of the current activity along the Wichita Mountain front that lies just to the southwest.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

Nelson Refinery Construction Index

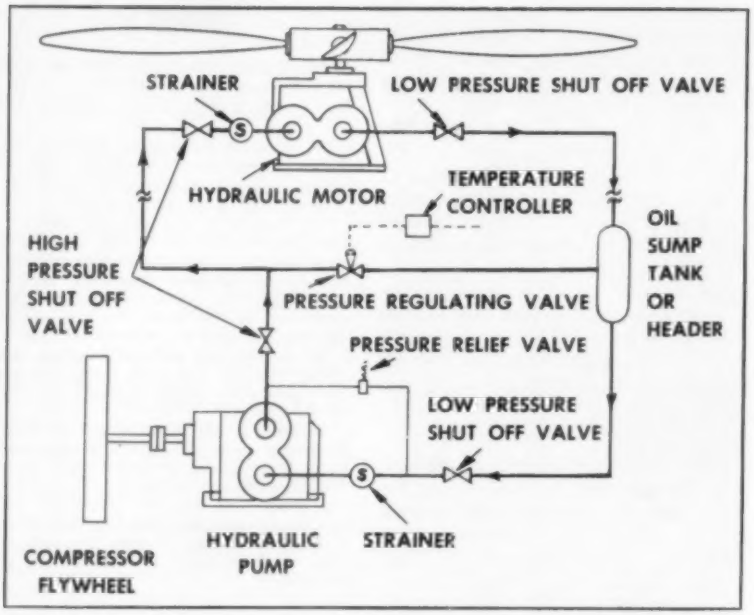
Appears in the Engineering Section in the first issue each month.
Compiled by W. L. Nelson, petroleum refinery consultant, Tulsa.

The Index was explained October 1, 1956 (page 110) as well as the Indexes of Individual Items of Equipment that appears on the Costimating page in the first issue of the months of January, April, July, and October.

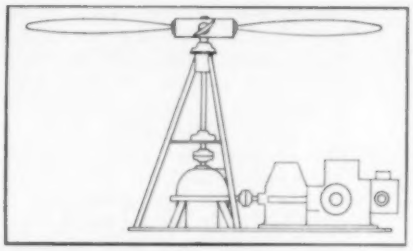
Index (1946 = 100)

	1950	1954	1955	1956	1957	Feb. 1958
Pumps, compressors, etc.	138.2	166.5	172.2	192.0	206.7	213.1
Electrical machinery	134.9	160.0	162.5	175.0	188.9	191.4
Internal-combustion engines	126.0	150.5	153.2	164.0	173.9	178.2
Instruments	127.8	154.6	162.9	182.1	187.4	193.2
Heat exchangers	140.0	171.7	156.8	190.7	203.6	193.5
Misc. equipment average	*126.2	160.7	161.5	180.5	192.1	193.9
Material component	149.5	174.6	176.1	190.4	201.9	203.9
Labor component	144.0	183.3	189.6	198.2	208.6	215.6
Nelson construction index	146.2	179.8	184.2	195.3	205.9	210.9

*Used in computing the Nelson Index until April 1952. This is slightly different from the average of the miscellaneous Equipment Items shown above.



HYDRAULIC variable-speed drive with hydraulic motor and pump. Fan is direct-driven by hydraulic motor; power oil for driving motor is circulated through closed piping system by positive-displacement pump, which in turn may be either direct or belt driven from electric motor, compressor flywheel, or other power source. Fig. 1.



TURBINE or engine drive used as a prime mover. Steam turbine is best where explosionproof equipment is necessary. Fig. 2.

So you've Air-cooled

MANY COMPANIES in all areas of the United States and Canada in the oil, gas, and chemical industries are turning more and more to air-cooled heat exchangers to dissipate heat when it cannot be profitably utilized.

Growing appreciation of the advantages of heat transfer through air cooling points up the need for greater understanding by users and suppliers of the specific needs of individual operations. Lack of information can lead to either over or under designing for the particular application involved.

Primary considerations . . . What determines the initial decision to dissipate heat into the air, rather than by the more conventional use of liquid coolants? Answers will vary as much as individual plants, processes, and company policies. In making his decision, the process engineer weighs more than the basic considerations of initial cost of equipment and cost of operation—he must consider, too, such factors as:

1. Availability and cost of cooling water.

2. Ambient air temperatures and desired outlet temperature of fluid to be cooled.

Determining the cost of water must take into account such factors as water treatment, pipelines, wells, and cooling towers. Moreover, in some areas there will be extra costs for preventing freezing of water-handling equipment, or for special materials or other preventive measures to cope with brackish or corrosive water that shortens equipment life. These factors must not be overlooked when considering initial and operating costs of the liquid and air-coolant systems.

Let us assume that careful study of all these factors has led to a decision to install an air-cooled unit. Now the design engineer must obtain from the process engineer the information needed to assure consistent quotations for proper evaluation and fully satisfactory equipment. This information falls into two categories: heat-transfer data and mechanical specifications.

The designer's calculation of heat-transfer coefficients presents no special problems—it need be only slightly more detailed than calculations for other exchangers. Drawing up mechanical specifications by purchasers is another matter, because equipment is field erected, and because the various parts are supplied by several different manufacturers.

Mechanical Specifications

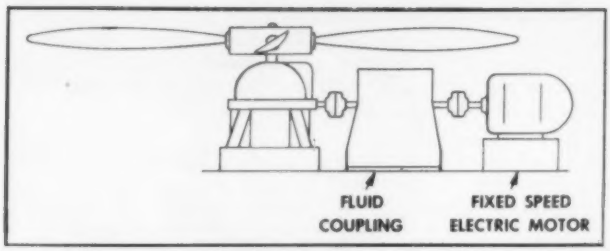
It is impossible, of course, to write a set of mechanical specifications to cover every conceivable type of duty. Revisions for individual jobs should be kept to a minimum to enable manufacturers to standardize their designs. Compare the price of today's complex automobile with the price of even the simplest custom-built equipment for dramatic proof of the advantages of standardization in high-volume production.

General . . . In preparing mechanical specifications, the process engineer must consider more than the usual factors—construction materials, available power, effect of startup, operation, and shutdown (particularly on metal temperatures and thermal expansion). Since almost all air-cooled exchangers are installed out of doors, he must also consider weather conditions, particularly temperature extremes and occurrence of hailstorms and high winds.

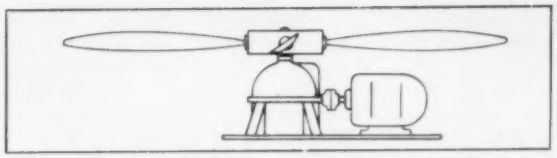
There are many possible designs for each component of an air-cooled exchanger. While it may be preferable, in most applications, to specify a particular design for each part, other considerations, such as price, are worth taking into account. Consequently, no attempt can be made here to pin down every detail of construction—final decisions must be left to the engineer responsible for obtaining assured performance and maximum value for each dollar spent.

Structure . . . The structure supports the finned-tube heat-exchange sections and the plenum chamber where air enters to be distributed under the sections. Since the larger exchangers are usually erected in the field, all material should be fabricated for assembly by bolting, with no field welding required.

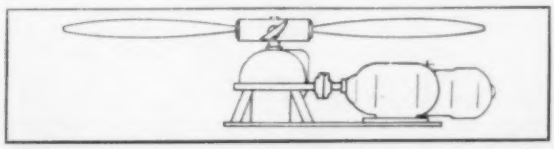
If complete assembly instructions are provided, erection supervision is unnecessary. The costs of future extensions of the structure can be reduced if some thought is given to



FLUID DRIVE has fluid coupling operating in conjunction with a fixed-speed electric motor for transmitting power at stepless variable speeds. There is no mechanical connection between the input and output members. Fig. 3.



CONVENTIONAL electric-motor fan drive has single-speed electric motor coupled to right-angle speed reducer. Fig. 4.



ADJUSTABLE-SPEED V-belt drive has stepless speed variation, and may be operated with either manual or automatic controls. Fig. 5.

decided to install heat exchangers?

Here are some tips that will help you to decide the kind to buy

BY EDWARD M. COOK AND PHILIP S. OTTEN
Griscom-Russell Co., Massillon, Ohio

this possibility when initial plans are made for the basic unit.

All-steel construction, designed and fabricated in accordance with AISC specifications, is recommended. Leakage of air around the sections and projection of finned-tube surface outside the structure should be avoided. Although design wind loading of 30 lb. per sq. ft. is commonly used, 40 lb. per sq. ft. is preferable, particularly in locations exposed to hurricane-force winds.

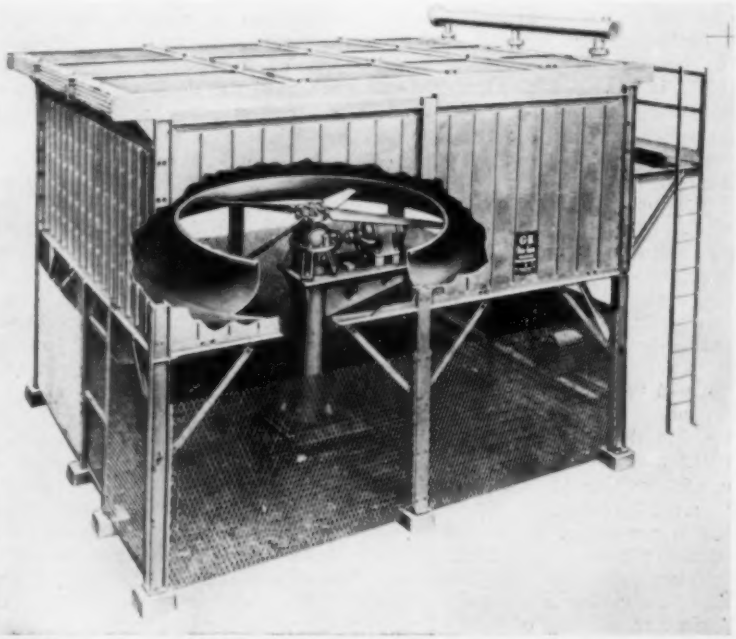
Sixteen gage sheet (minimum) is recommended for the side and end panels forming the plenum chamber, with vertical ribbing sometimes added for additional strength; deck plates where used for forced-draft design should be 12-gage.

When structures are wider than 10 ft., supporting columns of 6-in. H-beams (predrilled to accommodate future extensions without adding columns) are desirable. The entire structure should be given a coat of shop paint or should be hot-dip galvanized.

Walkway . . . A side-mounted walkway to facilitate maintenance and field testing is desirable, at least at the front header end of the structure. If draining or other manual operations take place at the rear headers, then a walkway could be provided at that end also. If the walkway is longer than 75 to 100 ft., a ladder at both ends is recommended; one ladder may suffice for shorter walkways.

Unless there is an individual plenum chamber for each fan (in multifan structure) the fans cannot be operated independently, and perhaps even simultaneous operation will be impaired. Fan rings of the belled type, constructed in segments, make it possible to remove individual fan blades by merely taking out one fan-ring segment. This is not necessary if clamped-type blades are used or a hole is cut in the fan ring. Smaller structures, unable to accommodate belled rings, may operate as efficiently with fan rings constructed of rolled channel sections. As a safety measure, fans should be at least 7 ft. above ground level; however, this depends on location and size.

Sections . . . Finned-tube sections comprise about 60 to 70% of the cost of a complete, well-designed air-cooled unit. A section consists essentially of a bundle of fin tubes with supports every 5 to 7 ft., a header or manifold at each end, and supports at each side that connect with the headers and tube supports.



TYPICAL three-section air-cooled heat exchanger. Shown are the plenum chambers, fan, and drive assembly. Fig. 6.

Construction must be able to withstand handling and vibration during shipment.

Since the sections are pressure vessels, it is recommended that they be designed and constructed in accordance with the ASME Code, Section VIII, and be ASME stamped by a qualified independent inspector.

While tubes of any desired alloy meeting ASME requirements are satisfactory for air-cooled exchangers, seamless tubing is preferred. Steel tubing can be used because the drying action of the fan on the warm tubes keeps the danger of atmospheric corrosion to a minimum.

When admiralty tubing is desired, specifying a particular inhibitor is not recommended, since this limits the number of suppliers and may result in shipping delays. Aluminum tubing, now being used successfully in jacket-water coolers, deserves consideration on the basis of lower price. It probably should not be used in sections having parts of copper alloys or other heavy metals because of possible galvanic corrosion.

Tube lengths . . . Where space and installation facilities permit, tube lengths of 30 ft. and even more can be used; however, the customer should specify when such long tube lengths are to be considered.

Copper, the original fin material in most air-cooled exchangers, has given way to aluminum, which has a lower cost per square foot of surface and is less subject to corrosion in some atmospheres. Other combinations of tube and fin alloys are possible.

Designers must consider both the fin material and its thickness and height in evaluating the heat-transfer coefficient. It can be assumed that aluminum will be the fin material used for most duties, but the resistance to heat transfer offered by finned tubes will vary from 5 to 10% of the total resistance (reciprocal of the heat-transfer rate). Thicker and lower fins tend to give lower metal resistance, while thinner and higher fins give poorer over-all heat-transfer rates.

Tapered fin . . . Most manufacturers produce a tapered fin, thinner at the tip. Fin thickness should average 0.012 to 0.014 to permit occasional careful walking on the sections and to resist hail damage. Where severe hail storms occur, hail screens should be used for added protection.

Here's a simple and fairly accurate formula for calculating the total surface of this type of finned tubing:

Total surface, in sq. ft. per foot of length = $(F^2-T^2) \pi N/24$ plus bare-tube surface, where F is o.d. of fin, T is o.d. of tube, and N is the number of fins per inch.

Some of the first spiral-wound fins were imbedded in grooves in the tubes, with the metal displaced from the groove then being forced against the fin base. This construction is now used chiefly for severe duties such as high-temperature applications since the temperature limitation approximately equals that of the tube itself.

Brazing methods that bond the fin to the tube without grooving are also used, but here the limitation is the brazing-compound softening temperature or the tube-metal temperature, whichever is less.

According to Griscom-Russell's experience, grooved-fin tubing can operate successfully at temperature levels as high as 1,100° F. and withstand many thermal-cycling tests with liquid metal in tubes for periods over a year. Grooved tubing and welded and integrally made fins have proven equally satisfactory in heat-transfer rating tests.

Tension-wound fins have given equally good performance where temperatures were moderate and the tubes were either hotter or no more than 50° F. cooler than the fins.

Tubing specs . . . Most commonly used tubing in air-cooled exchangers is 1-in. o.d. with fins ½ to ⅝ in. high, although smaller tube diameters are frequently used to give higher velocities with low rates of flow. Larger-diameter tubes, such as 1½-in. iron-pipe size can be specified for fouling and other severe duties, such as those encountered in refineries. Occasionally tubes without fins have been used for fluids with very poor heat-transfer characteristics, such as heavy lube oils.

Although TEMA standards do not apply specifically to this type of equipment, they should be specified and are pertient to the machining of tube holes in tube sheets. The applicable sections of R-7.2, "Tube Holes in Tube Sheets," cover tube-hole diameters, tolerances, finish, and the machining of at least two grooves in each tube hole to secure the tube properly.

Headers generally are of cast-iron, cast-steel, or welded-plate construction. Pipe manifolds are also used in special cases, furnished either by the section manufacturer or the piping contractor. Cast-iron headers, satisfactory for some low-temperature and pressure duties as limited by the ASME code, usually lower the price of a complete exchanger by about 5%.

Cast iron gives good service for less severe duties such as water cooling and steam condensing, and should be specified wherever freezing can occur in the section, for freezing often will crack the header rather than seriously distort or split the K-fin tubes, which are more expensive to replace.

Floating header . . . Sections should be constructed with one header floating, to allow for thermal expansion; both headers should provide for venting and draining. Horizontal partitions are preferred for maximum corrected logarithmic mean temperature difference; necessary additional surface can be added to offset the lower LMTD when vertical partitions are used, but this may restrict future use of the exchanger if closer temperature approach is required.

Tubes should be individually supported to assure free movement. They should be roller expanded into tube sheets of ¾-in. minimum thickness by approved methods (electronic control desirable).

Access to tubes must be provided by bolted-on cover plates, or by plugs, one for each tube end. Pipe plugs with tapered threads holding the pressure are commonly used, but a plug with machine threads and a shoulder mating against a spot-faced surface on the header gives better protection against leaks. Plug sheets should also be at least ¾ in. thick.

Fans . . . Depending on their length, the smallest units use from one to six small-diameter, high-speed fans, with two or more 4 or 5-ft.-diameter fixed-pitch blades, directly connected to the motor or other driver. All but the smallest units use either one or two fans per cell with blades adjustable to the amount of air required.

Whenever possible, two fans should be specified—a great advantage in terms of convenient maintenance, control, and safety margin in the event of mechanical failure, all at an additional cost that is only a small percentage of the total.

Occasional trouble from excessive vibration can be avoided if these two items are specified:

1. A vibration cutout switch that automatically cuts off the fan, and,
2. Statically and dynamically balanced fan hubs and blades balanced against a master blade (this procedure also makes the blades interchangeable, thus simplifying installation and replacement).

Fans as large as 18 ft. have been used on air-cooled exchangers, but since the larger diameters often spell more trouble, 14 or even 12-ft. di-

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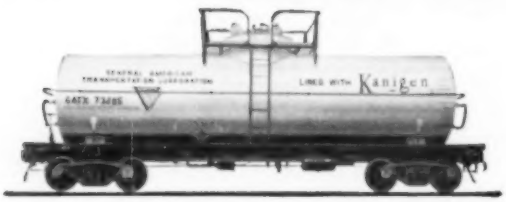

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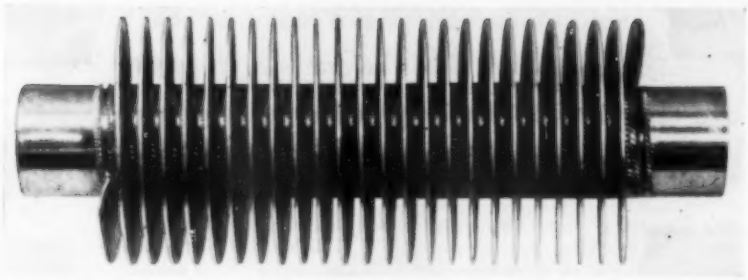
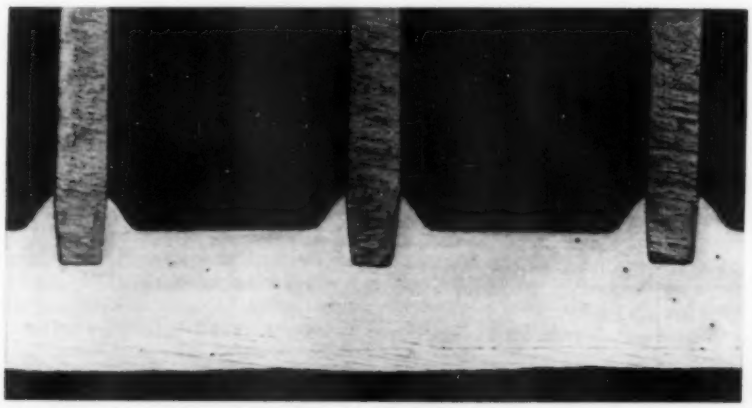
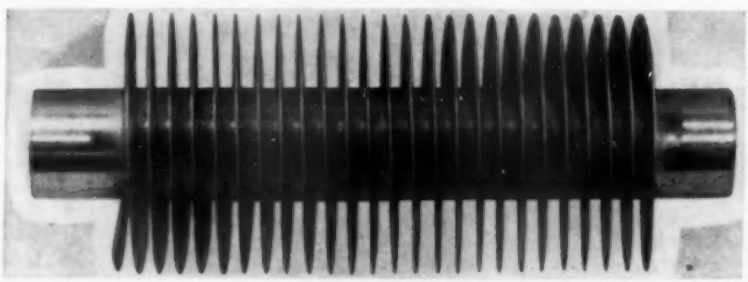


HEAVY-DUTY fin tubing. A helical groove is plowed on the outside surface of the tubing or pipe. Precoiled fin is then tightly wound into the groove. Ridges formed by grooving are then pressed against each side of fin for metal-to-metal bond. Fig. 7.



HERE IS A CLOSEUP of the heavy-duty fin tubing shown in the top photo. This microsection shows the root of the fin embedded and locked into the tube wall. Fig. 8.



MODERATE-DUTY fin tubing, for metal temperature limits of 225° F. Precoiled fins are spaced on the tube under tension and held in place by a seat formed by the knurling rolls on each side of the fins. Fin ends are soldered to the tube to prevent damage of fins during handling. Fig. 9.

ameter is more commonly specified as a maximum. Blade-tip speed influences both the amount of noise produced and the life of the blade.

Tip speeds up to 12,000 ft. per minute are commonly used, although fan manufacturers may guarantee their product for higher speeds. (The smaller, fixed-pitch fans mentioned previously are operated at speeds as high as 22,000 ft. per minute for the 4-ft. diameter and 18,000 ft. per minute for the 5-ft.-diameter fan, but these fans are of different construction, able to withstand high speeds.)

Driving equipment . . . Electric motors, gas engines, steam turbines, or other types of drivers are selected in the same manner for air-cooled exchangers as for other types of equipment; similarly, standard procedures apply to choice of transmission of power to give the fan the proper speed. V-belt drives can also be specified.

Heat Transfer Information

With the exception of certain items peculiar to air-cooling, the information required by the equipment designer for proper rating of an air-cooled exchanger is basically the same as that required for other heat exchangers. In general, the designer must have data falling into two categories: properties of the process fluid, and physical data concerning process conditions.

The latter category includes quantities, operating and design temperatures and pressures, unusual or severe startup, operating or shutdown conditions, allowable pressure drop, fluid velocities, and any other process limitations. But for air-cooled units, additional information must be obtained:

1. Design high and low ambient temperatures.
2. Elevation above sea level.
3. Mechanical specifications affecting heat-transfer calculations (particularly maximum horsepower permitted, dimensional limits, tube and fin construction materials, and type of control required).

The first consideration, in selecting the design maximum ambient temperature, is whether or not the equipment must perform at full design conditions during the warmest weather (this is usually the case). Where undisturbed flow of air to and from the unit is assured, this can be the ambient temperature that will not be exceeded during more than about 2 to 5% of the time.

Caution: The presence of a building or other obstruction within 100 ft. may cause a downdraft, resulting in recirculation of some warm air and raising the average air temperature to the fans by 3° or more, depending on wind velocity and direction.

Similarly, placing air-cooled exchangers near a source of heat should be avoided; for example, compressor discharge gases, even if released at a high point, can be caught in a downdraft, raising air-inlet temperature 15° or more above the ambient.

Minimum temperature . . . Wherever freezing is a possibility, minimum design temperatures should be specified. Reduction of fluid flow, as in a bypass system for controlling outlet temperature, is the greatest cold-weather danger; bypassing should be avoided, particularly in water cooling. Freezing in tubes is almost impossible as long as a reasonable rate of flow is maintained.

Minimum design temperature is required for another reason: air density is higher at lower temperatures, thus increasing the weight of air handled by a fan. Under some conditions, it may require higher horsepower, with consequent overloading of the driver. However, the usual practice, since less air is required, is to use two-speed motors, louvers or variable-pitch fans.

or variable speeds as obtained with gas engines and turbines, to reduce fan speed.

In the case of motor-driven fans, reducing speed by one-half reduces power consumption to one-eighth. This reduction must be made whenever possible. During the summer it is sometimes undertaken at night to reduce power costs, particularly during evening peak-demand periods.

Air density must be known to calculate static-pressure loss of air across finned tubing and to determine needed fan size, pitch angle, and horsepower. Thus site elevation above sea level must be known within about 200 ft. Elevation and average high and low temperatures for each month of the year at many locations in the U. S. can be found in U. S. Department of Commerce Technical Paper No. 31.

Although maximum allowable horsepower (or desirable range) is seldom specified, reasonably comparative quotations cannot be obtained without it. The horsepower limits the amount of air blown across the tubes, a factor governing not only the MTD but also in many cases the greatest part of the heat-transfer rate.

Fluid properties . . . Many heat-transfer ratings are made without all the information needed for accurate analysis. Yet more complete and accurate information produces more reliable ratings.

Properties required (preferably at two temperature points) are: specific gravity (molecular weight for gases), specific heat, viscosity, and thermal conductivity. Still more information is needed when a change of phase is involved—for example, latent heats and dew points, to permit drawing of a condensation curve if one has not been furnished.

These data, of course, are not necessary when noncondensables are not present or when straight-line condensation takes place throughout the operating temperature range.

For many common substances—water, steam, ammonia, light hydrocarbons, SAE oils, transformer oils, fuel oils, and others—only the name and classification need be given, since required properties can be determined from the general literature. However, there is no sharp dividing line between common and uncommon substances—as in the case of absorption oils and other hydrocarbons.

For example, giving the API number and the characterization factor (K) helps the designer establish the properties with a fair degree of accuracy. For gases over 200-psi. operating pressure, the critical properties of pressure, temperature, and volume are also required to compute density, specific heat, viscosity, and thermal conductivity at the elevated pressure.

"Many heat-transfer ratings are made without all the information needed for accurate analysis. Yet more complete and accurate information produces more reliable ratings."

If, for any reason, the process engineer must withhold the name of the fluid, necessary properties can be given as noted above. However, requests for quotation giving no properties and listing the process fluid as merely "organic" are the despair of designers.

The possibility of receiving inconsistant, competitive quotations is perhaps the greatest disadvantage in asking designers to estimate properties. True, some properties may have a relatively small effect on the rate of heat transfer in an air-cooled exchanger, and also values for many common substances fall within a fairly narrow range.

Yet, since viscosity of a single liquid at different temperatures can vary from less than one to several thousand centipoises, it is wise for the process engineer, when property information is left up to the designer, to request that properties used in the calculations be shown on the supplier's data sheet.

Liquid data . . . When liquids are involved, information as to the viscosity is virtually indispensable to the designer, especially since it influences both rate and pressure drop. For gases, the viscosity may be approximated if the type of fluids and molecular weights are known, since most gas viscosities do not vary much over reasonable temperature ranges.

However, most liquid viscosities change markedly with temperature and should be given at least two temperatures in the operating range of the exchanger, if the range is over approximately 150°. If only one viscosity point were given at, say, 100° F., is is unlikely that any two design engineers would come within 100% of each other when extrapolating to 600° F.

The effect of this property is so important in certain situations with long temperature span, that it is necessary to make stepwise rate and pressure-drop calculations and integrate the results. In long finned tubes of standard diameter (16 to 30 ft. by 1-in. diameter) the change of rate at one point is greater than the cube of the change in viscosity. Although data on other properties are essential for accurate work, no property is as important as viscosity.

No one set of rules could cover all the properties requirements for heat exchangers. For example, in order to determine the amount of water vapor and its effect on the heat load if water condenses, both the design ambient temperature and humidity are needed for exchangers cooling air.

Quantities and temperatures . . . Total and partial quantities of each different compound in the process fluid are required, including the phase conditions of the entering and leaving fluids for the partial components. If possible, a condensation curve should be included for condensation duties, an essential factor for fluid desuperheating and condensing. While the designer may be able to compute the necessary curve satisfactorily in many cases, widely differing competitive quotations may result.

A consideration usually omitted for other types of exchangers, built in a range of sizes with small graduations, becomes important in standard-design air-cooled exchangers which lack such versatility: specifying range of permeable temperatures for a given heat load in addition to the total heat load and desired inlet and outlet temperatures.

This extra information is an economy consideration—varying the temperature range slightly can result in substantial savings.

Pressure and pressure drop . . . Usually designers like to know operating pressure of the liquid or gas being handled, but this is essential only when gases or vapors are present in any proportion, since their physical properties vary with pressure.

Provided all other conditions remain the same, a higher allowable pressure drop results in higher heat-transfer rate, because higher pressure drops result from higher fluid velocities, in turn giving higher rates. In the case of a fluid with good heat-transfer properties, such as water, the rate improvement in an air-cooled exchanger may be barely significant, for the heat-transfer coefficient on the water side may be only 5 to 10% of that on the air side.

But the improvement becomes significant for fluids of poorer heat-transfer characteristics, especially

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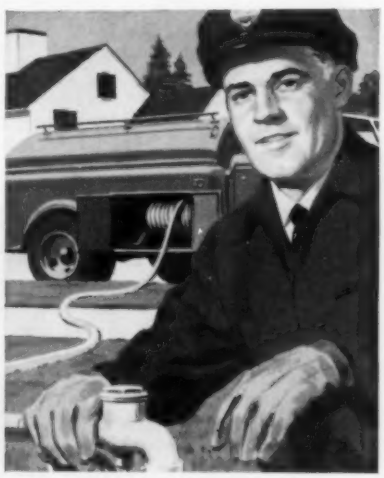

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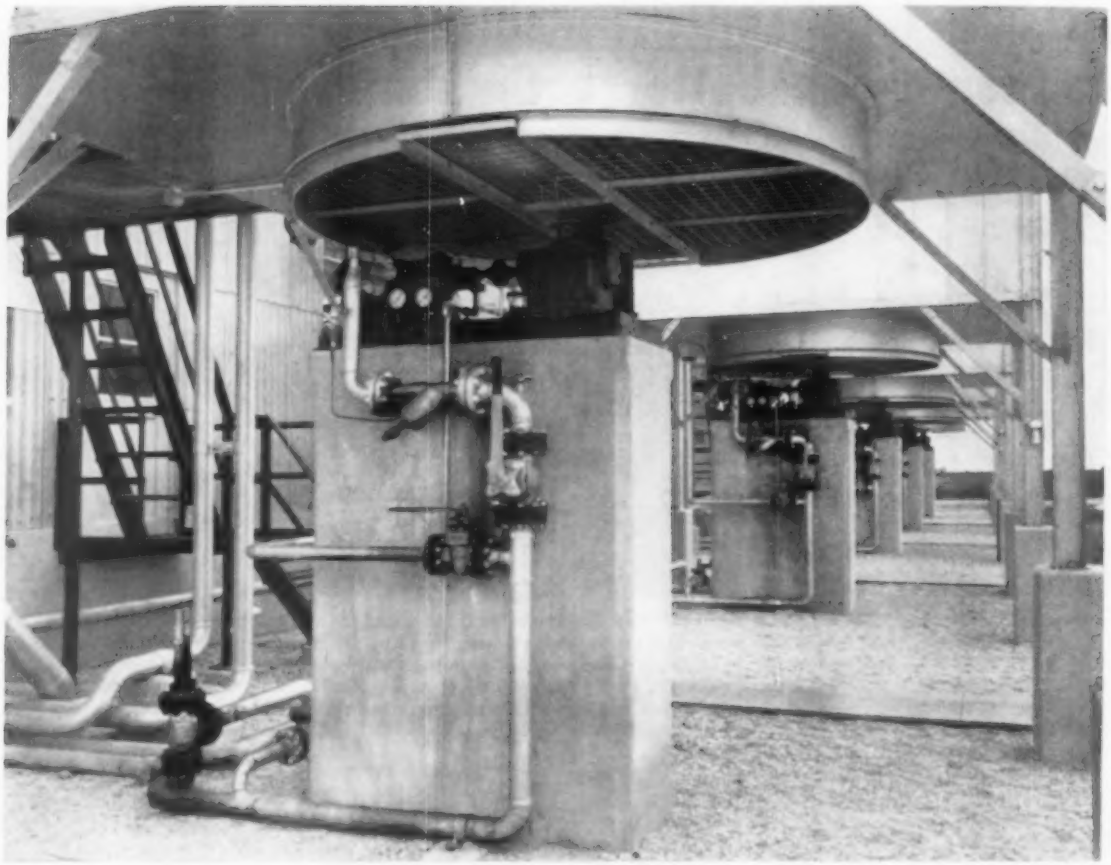

HYDRAULIC-DRIVE installation in a heat-exchanger setup. Fig. 10.

those with high viscosities at operating temperatures. As a result, it is customary to allow pressure drops of 20 psi. or even higher for such high-viscosity fluids as heavy lube oils.

For any fluid, more economical selections would result if piping pressure losses were figured less conservatively than is generally the case and the excess passed on to the exchanger. However, pressure losses in piping should not be ignored.

Fouling factors . . . A fouling factor is an estimate of the increase in heat-transfer resistance (reciprocal of the heat-transfer rate) above theoretically clean requirements needed to allow enough excess surface to compensate for the rate reduction due to fouling. Ideally, the process engineer specifies the required fouling factor on the basis of past experience with the fluid; lacking such experience, he may rely on the value listed in TEMA or other sources.

Unless a heavy coating of material builds up, the effect of fouling on the outside of the finned tubing of an air-cooled exchanger is very small. Nevertheless, since finned tubing occasionally is fouled by material even fans cannot dislodge, some operators clean off the tubes with steam or high-pressure air each spring to prepare for warmer weather.

Fouling factors inside the tube must be carefully considered since they have a greater effect on the transfer rate and over-all size of the exchanger than they do in shell and bare-tube exchangers. The common practice in designing finned-tube exchangers is to refer all film coefficients or resistances to the outside surfaces.

Therefore, dirt factors inside the tube must be multiplied by factors of 10 to 20, depending on tube and fin design, when referred to the outside surface. Most finned-tube exchangers will operate satisfactorily when the fouling factors do not exceed 0.0011, even though higher values for similar conditions are recommended by TEMA.

Safety factors . . . Safety factors are another vexing problem. Sometimes a unit is in operation before it is realized that the customer, the contractor, and/or the supplier have overspecified safety factors. To avoid this, the user should either give performance design specifications without a safety factor, and so state, or else specify to the supplier the safety factor he is to use. Or, the designer can advise how much "fat" is in the unit quoted, expressed as fouling factor or excess surface.

Fouling factors given by the designer should indicate clearly whether they are based on the inside or outside surface of the finned tubing.

It is important, in every case, that heat-transfer rating, pressure drop, air quantity, and all other data requested by the customer and specified by the supplier, be guaranteed for a reasonable length of time after shipment of the unit. Careful preparation of specifications and adequate guarantees will go far toward assuring desired performance from air-cooled exchangers.

These precautions are not a substitute for a good understanding between purchaser and vendor. However, mutual recognition of the requirements of each will give greater value per dollar spent and at the same time will further boost the rising acceptance of cooling by air.

HERE'S PROOF* . . .

BOSTON'S *B-228* PROCESS MORE THAN DOUBLES O.S.&D. HOSE RESISTANCE TO SUN AND WEAR!

You are looking at dramatic proof that the new B-228 Process developed for the covers of BOSTON Oil Suction and Discharge Hose more than doubles resistance to sun, abrasion and tearing! Each of these two swatches of O.S. & D. Hose covers has aged for exactly the same length of time. The upper swatch from the BOSTON cover is as good as new. The lower swatch from the ordinary cover is cracked, torn, and deteriorated.

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*Unretouched Photograph

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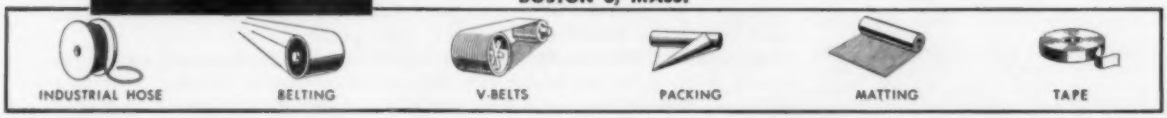
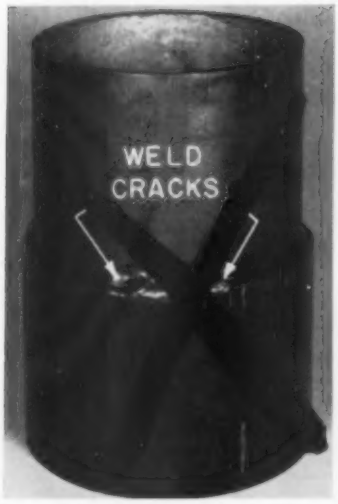
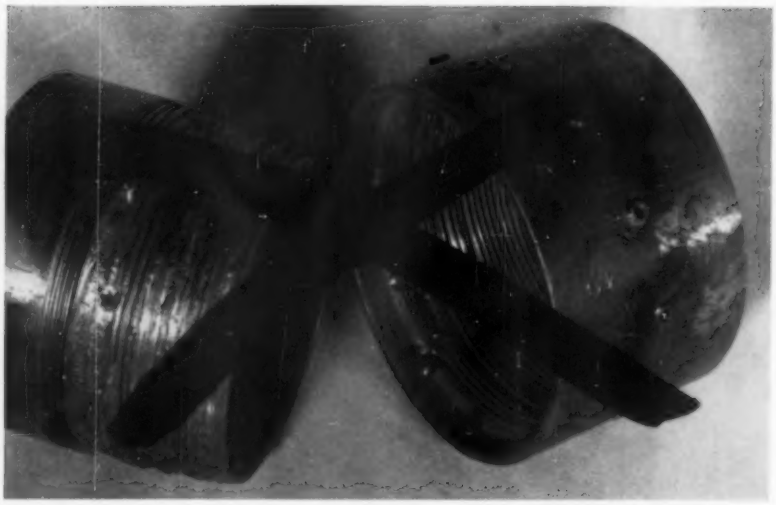
BOSTON 3, MASS.





SMALL CRACKS such as these may lead to a bad fishing job. Fig. 1.



SET SCREWS of various numbers and sizes proved unsatisfactory in preventing the casing from parting. Fig. 2.

No more casing breakouts? Here's something new in a

Casing-joint thread lock

that gives promise of overcoming weaknesses of other methods

A technique and compound have been developed for use in locking casing joints. This procedure prevents disengagement of the lower section from the main string as drilling operations are performed below the casing. A thermal-setting epoxy resin especially compounded for this application is substituted for thread dope on the joints to be locked. Based on laboratory tests, this material produces a joint which has a greater resistance to breakout than that obtained by tack welding the made-up joints; the latter method is the accepted procedure by many operators. In extended field use this technique and material for locking casing joints are easily applied by drilling personnel, eliminating the services of a welder.

BY MARTIN E. TRUE AND W. A. PITTS
Humble Oil & Refining Co.

IN THE DRILLING of oil wells, surface and protective casing strings are set and cemented to isolate formations and to minimize the possibility of stuck drill pipe as subsequent deeper drilling is carried out.

The drill pipe rotates in a clockwise direction inside the casing. Friction between the drill-pipe tool joints or rubber protectors acts against the casing and applies a rotational force to the casing also in a clockwise direction. This force can be sufficient to overcome the combined resistance of the threaded casing connection and the friction or bond between the casing and the wall of the hole. As a result, it will cause the disengagement of the lower section of the casing from the main casing string.

In many instances, the disengaged portion of the casing string has moved downward in the hole and remains as an obstacle. This requires that special care be taken as drill tools and pipe traverse this interval. With enlarged hole conditions below the point of disengagement, the loosened section of casing is likely to fall to one side to form an obstruction in the hole and block the entry of drill tools below this point.

Even if the loosened section remains in relative alignment, the passage of drill tools is likely to damage

Paper presented at spring meeting of the Southwestern District, API Division of Production, Fort Worth, under the title, "Casing-Joint Thread Lock."

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-320°F.

PROPERTIES

Minimum tensile strength	90,000 psi.
Minimum yield strength	60,000 psi.
Elongation in 2 inches, minimum, per cent	22.0

Charpy impact tested in accordance with ASTM A-300 Specification down to −320° F.

-320°F.

COMPOSITION

Carbon, maximum, per cent	0.13
Manganese, maximum, per cent	0.80
Nickel, per cent, (approx.)	9.00
Silicon, per cent, (approx.)	0.30
Phosphorous, maximum, per cent	0.035
Sulfur, maximum, per cent	0.040

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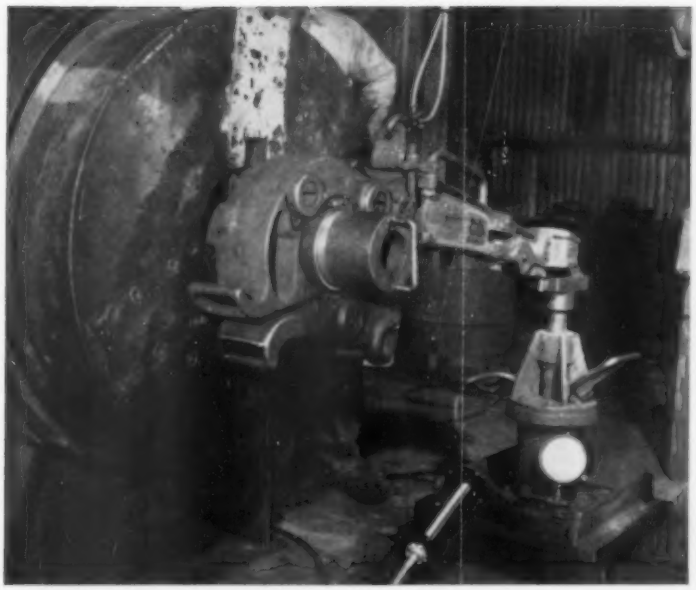


EXPERIMENTS WERE CONDUCTED on 5½-in. casing, using this torque-measuring machine. Fig. 3.

THREADS being coated with thread-lock. Joint is then made up. Fig. 5.

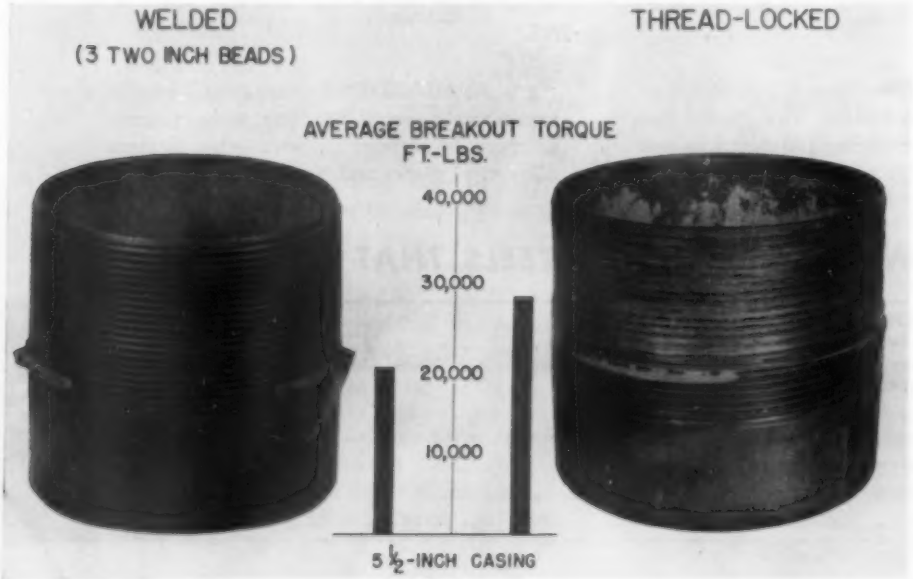
and partially close the upper opening and prevent the drill bit from entering. In many case histories, this has resulted in the loss of the hole below the loosened section of casing. Consequently either the hole must be sidetracked above this depth, or it must be abandoned completely.

Welding . . . Standard practice for many operators is to tack-weld the lowermost casing connections; some consider that three joints secured in this manner are adequate. Three equally spaced circumferential weld beads, 2 in. in length, applied at the juncture of the pipe and collar frequently are used in these field-welding operations.

Special precautions are required during the welding of alloy steel, particularly that type of alloy which is used in today's high-strength casing. When welding grade N-80 casing, it is considered essential to preheat the area adjacent to the weld to a temperature of 600° F. After the weld is completed, the area in the vicinity of the weld should be stress-relieved by postheating to a temperature of 600° F. Then sufficient time should elapse for the pipe to cool to a safe low temperature before being immersed in well fluid. The heated portion of the casing should be protected from rapid cooling if performed under inclement weather conditions.

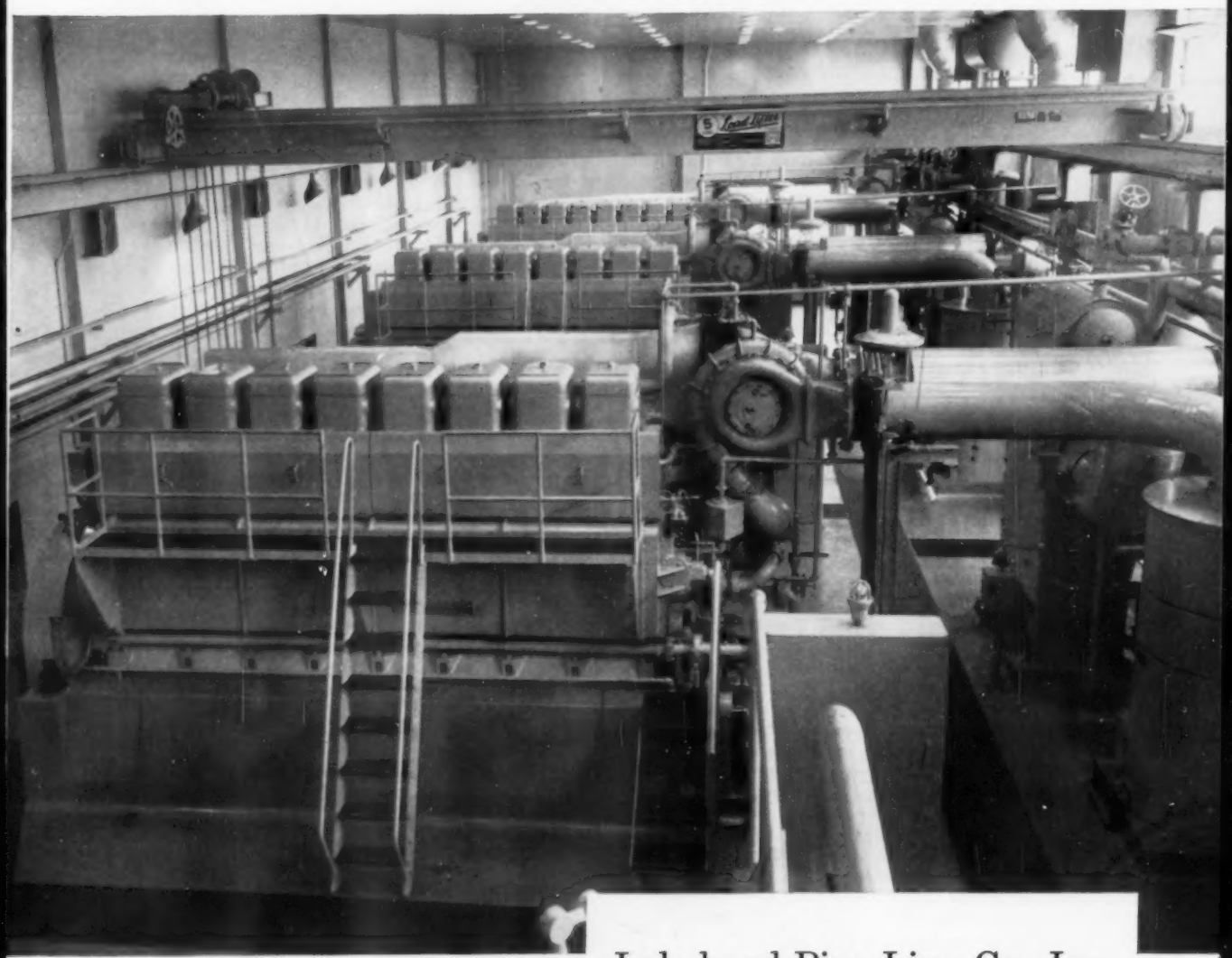
Casing which has been heat-treated to obtain high strength should not be welded, particularly under oil-field conditions, because the application of such intense heat will change the characteristics of the steel. Embrittlement of steel is one alteration likely to occur. This will reduce the impact resistance of the metal causing a condition which may result in failure.

The difficulty of obtaining a de-



THREAD-LOCKED JOINTS require a higher breakout torque than welded joints and help eliminate costly fishing jobs. Note the difference in appearance between the two joints. Fig. 4.

NORDBERG ENGINES FOR PIPE LINES



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pendable weld even during laboratory tests has emphasized the problem with which the oil-field operator is confronted. Welding under normal conditions, in general, is not conducive to the best results. Inspection of welds made both under laboratory and field conditions has revealed that small cracks are present in some of the weld beads immediately after cooling. Fig. 1 shows cracks which developed in a weld performed in the shop. These cracks form points of stress concentration which may lead to failure as drilling progresses.

New Technique

Research work was initiated for the purpose of evolving a technique for locking casing joints which would:

1. Eliminate welding.
2. Provide a simple method which could be used by the drilling crews.
3. Be less expensive to use than welding.
4. Most important of all, permit the use of a method which can be applied with assurance that failures in the bottom casing joints will not occur.

First efforts negative . . . Initially, it was assumed that it should be a relatively simple matter to add materials to the thread compound which would result in galling and subsequent freezing of the joint in attempted breakout. Laboratory tests showed that this was a false assumption. Introduction of various types of foreign material, such as hard grit and coarse iron filings, had relatively little effect on the torque to disengage joints. Materials which harden on setting, such as mixture of glycerin and litharge, resulted only in a small increase in torque requirements for breaking out joints.

Mechanical interference was the next approach tested for locking joints. These included various means of damaging threads, such as driving pins into the made-up threads of the joints by powder charges. Casing collars were tapped (Fig. 2), for various numbers and sizes of set screws with matching countersunk holes drilled in the threaded portions of casing after joint make-up.

Most of the methods tested resulted in some increase in the torque required for breaking joints. All, however, were below the minimum of 16,000 ft.-lb. required to break joints of 5½-in. casing which had been tack-welded in the laboratory. Since the breakout torque for tack-welded 5½-in. casking joints varied from 16,000 to 26,000 ft.-lb. the higher value was selected as the goal for the minimum acceptable in the use of a new technique. The 5½-in. casing size was selected for laboratory investigation because the torque-measuring equipment, illustrated in Fig. 3, lacked capacity for breaking casing joints of a larger size.

Epoxy adhesives . . . Encouraging results were obtained with commercially available thermal-setting epoxy resins. Experiments showed that the addition of grit, such as aluminum oxide, to the epoxy compound produced a joint which, upon setting up, offered resistance to breakout consistently greater than the maximum obtained by tack-welding. Fig. 4 shows the appearance of welded and epoxy-coated joints after being broken out and gives the relative torques required to break the joints.

The characteristics of thermal-setting epoxy compounds are affected by:

1. Well-bore or curing temperature.
2. The type and amount of accelerator or catalyst. Atmospheric temperature influences pot life and consistency of the material and can become a factor during the physical application of the material to the threads while making up the joint. The compound currently being used on a routine basis has a pot life of about 2 hours under summer atmospheric conditions and longer under cooler temperature.

Laboratory tests reveal that the epoxy selected retains its bonding strength up to a temperature of 350° F. Occasionally, it becomes necessary to break out a joint in which the thread-lock material has set up. This can be done by raising the temperature of the joint to 550° F.; the heat will soften the material sufficiently to permit it to be backed out with approximately the torque used in the initial makeup.

Tests were run to determine the effect of various materials, such as grease, thread dopes, kerosine, and other cleaning solvents. These revealed that grease and thread dopes on the thread, when the epoxy is applied, materially reduced the final strength developed in the joint. Kerosine or other solvents, however, appeared to have little effect on the bond.

Field method . . . Here is the field technique currently used in applying thread lock to casing joints (Fig. 5): (1) Remove the collars; (2) clean threads on both male and female members; (3) coat both threads with thread lock; and (4) make the joint up to the normal amount, after which the joint can be immediately lowered into the hole.

The well-bore temperature is sufficiently great to provide the heat necessary to produce the thermal reaction to cause the bonding material to set in the time required for setting the casing string and waiting for the cement to set.

The heat generated by the cement will accelerate the epoxy reaction.

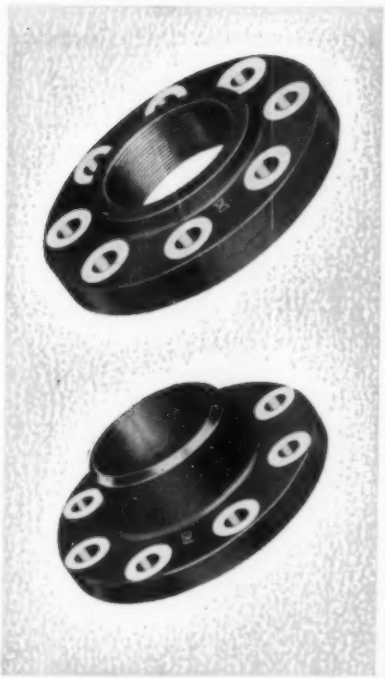
Tower moved in record rail haul

A FRACTIONATING tower, said to be the largest shop-fabricated processing vessel ever manufactured, recently was shipped by rail from Houston to Lake Charles.

Built by Wyatt Metal & Boiler Works, Houston, it has an over-all length of 208 ft., 6 in. and outside diameter of 13 ft., 8 in.

The Association of American Railroads rated it as the longest cargo ever hauled by rail. The vessel also is said to be the largest diameter ever shipped by rail since it required the maximum available clearance on the Houston-Lake Charles run.

The tower was fabricated for Tellepsen Petro-Chem Constructors, Houston, for installation in the Lake Charles plant of Cities Service Oil Co.



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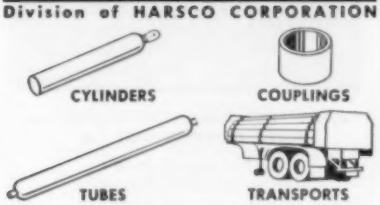

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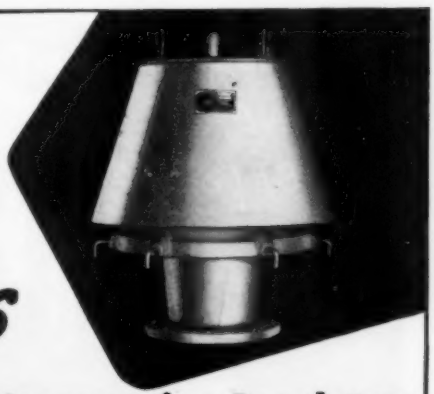

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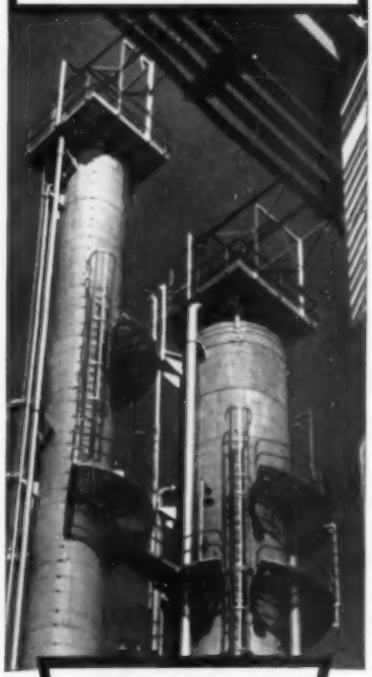

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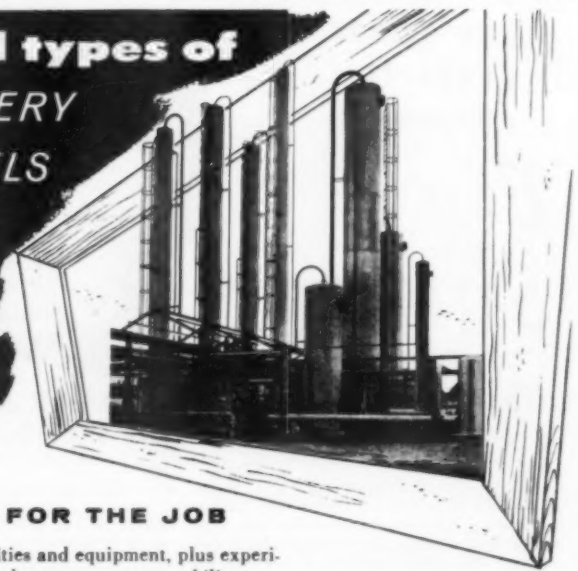

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More on SBA acetylene

Either natural gas or liquid hydrocarbon feed can be handled, with two burner designs developed. Here are some cost estimates when operating on either feed for 20 and 60-million-pound per year acetylene plants.

THERE HAS BEEN a flurry of interest recently in the Societe Belge de l'Azote process for making high-purity acetylene by partial combustion of natural gas. Alternately, this process can employ naphtha or other liquid feed stock to make acetylene (and ethylene) by what more closely approaches a true cracking process. Two different burner designs have been developed for each type of stock.

The SBA process has had a long development, first in an SBA pilot unit at its Renory plant, near Liege and (since 1953) in the demonstration unit at Marly, near Brussels. Over the last 4 or 5 years SBA has tested burners in capacities up to full commercial and has operated acetylene-purification system which employs ammonia.

- Key feature of the process is the burner design which is intended to minimize carbon formation. This is an all-metal burner; it does not employ refractory burning blocks. Water jackets provide protection against the high temperature. The Type I burner for natural gas and the Type II burner for liquid feeds are stated to be interchangeable with minor modifications in process design.
- The acetylene purification process uses a prepurification step which insures rejection of higher acetylenes. This is said to virtually eliminate polymerization and fouling in the acetylene recovery equipment which follows.

Process

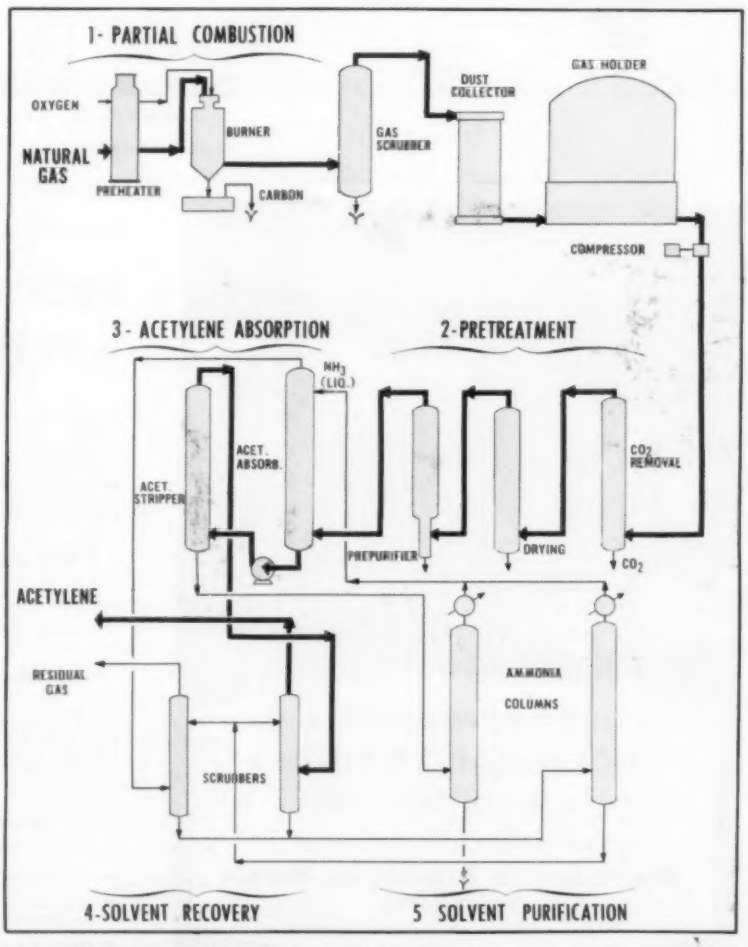
When employing natural gas or other methane-rich gas feed, the feed and the oxygen are first preheated. This reduces required combustion in burner, improves yield, and results in higher concentration of acetylene in the burner effluent. In this partial combustion process condensation reactions appear to predominate over the cracking reactions.

Burners . . . The Type I burner is said to use a smaller, less-complicated mix-zone design than burners used in other processes. This allows feed preheat temperature to be increased with resultant greater yield of acetylene. Reaction zone design is such as to limit the cracking reactions so that carbon formation is minimized. Mechanical cleaning is not used; a water spray continuously removes carbon from the burner. It is said this burner can be brought to full operating temperature in a few minutes.

Operation with the Type II burner proceeds this way: Fuel used in the combustion zone may be a portion of the feed stock itself. It could be gas formed by pyrolysis in the burner. Again, the fuel may be hydrocarbon gases from an external source. Vaporized feed is injected into hot combustion gases beyond the combustion zone. Cracking reactions are predominant and ethylene is also made in amounts dependent on operating conditions.

Burner effluent gas is quenched by a water spray. It then goes through electrostatic precipitators where fine carbon particles are removed.

Prepurification . . . Before absorption of acetylene in the ammonia solvent, the impurities are removed that would cause trouble in the absorption operation. These are CO_2, moisture, heavy hydrocarbons including some of the



AN ALL-METAL BURNER designed to minimize carbon formation is one feature of the Societe Belge de l'Azote (SBA) acetylene process. Ammonia is employed as solvent in the ethylene purification.

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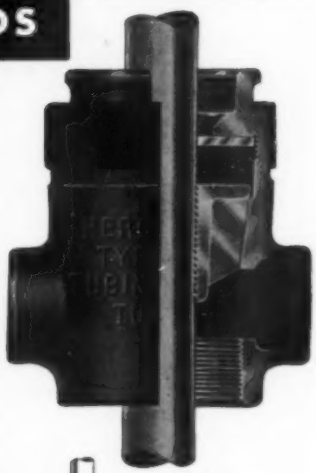

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TABLE 1—SUMMARY OF DIRECT OPERATING COSTS

Case number	1		2		3		4	
Investment*	$4,000,000		$4,700,000		$7,800,000		$9,000,000	
Feed stock	Natural gas		Naphtha		Natural gas		Naphtha	
Acetylene purity	99.6%		99.5%		99.6%		99.5%	
Capacity, million lb./yr.	20		20		60		60	
Direct operating cost—	$/yr.	c/lb.	$/yr.	c/lb.	$/yr.	c/lb.	$/yr.	c/lb.
Labor 4 men/shift†	95,000	.48	95,000	.48	95,000	.16	95,000	.16
Steam at 40c/1,000 lb.	111,500	.56	92,000	.46	334,000	.56	276,000	.46
Power and 0.8c/kw.-hr.	16,000	.08	30,000	.15	48,000	.08	90,000	.15
Cooling water at 1.0c/1,000	38,000	.19	46,000	.23	114,000	.19	138,000	.23
Fuel gas at 20c/M.M.B.t.u.	26,000	.13	63,000	.31	78,000	.13	189,000	.31
Chemicals and solvents	148,000	.74	146,000	.73	444,000	.74	438,000	.73
Maintenance at 4% of investment	160,000	.80	188,000	.94	312,000	.52	360,000	.60
Total direct operating costs	594,500	2.98	660,000	3.30	1,425,000	2.38	1,586,000	2.64

*Acetylene unit only, exclusive of oxygen unit, services and off-sites. †Includes supervision.

TABLE 2—ECONOMICS OF ACETYLENE PRODUCTION

Case number	1		2		3		4	
Investment	$4,000,000		$4,700,000		$7,800,000		$9,000,000	
Feed stock	Natural gas		Naphtha		Natural gas		Naphtha	
Capacity, million lb./yr.	20		20		60		60	
Acetylene purity	99.6%		99.5%		99.6%		99.5%	
Debits—	$/yr.	c/lb.	$/yr.	c/lb.	$/yr.	c/lb.	$/yr.	c/lb.
Feed stock at 20c/M.M.B.t.u., 1.0c/lb.	400,000	2.00	717,000	3.58	1,200,000	2.00	2,148,000	3.58
Oxygen*	404,700	2.01	337,000	1.68	820,100	1.37	676,000	1.13
Direct operating cost	594,500	2.98	660,000	3.30	1,425,000	2.38	1,586,000	2.64
Property tax and insurance at 3% of investment	120,000	.60	141,000	.71	234,000	.39	270,000	.45
Interest at 4% of investment	160,000	.80	188,000	.94	312,000	.52	360,000	.60
Total debits	1,679,200	8.39	2,043,000	10.21	3,991,100	6.66	5,040,000	8.40
Tail gas credit at 20c/M.M.†	240,000	1.20	122,000	.61	720,000	1.20	366,000	.61
Net cost	1,439,200	7.19	1,921,000	9.60	3,271,100	5.46	4,674,000	7.79

*Costs vary with quantity required. Consumption (100%) is 5.3 tons/ton acetylene for natural gas and 3.5 tons/ton for naphtha. †Includes ethylene at fuel-gas equivalent.

higher acetylenes, tars, etc. The CO_2 may be removed by conventional amine or other process. Scrubbing with cold methanol removes certain higher acetylenes and aromatics.

Absorption . . . Refrigerated anhydrous ammonia contacts the prepurified gas in the absorber at atmospheric pressure and some undisclosed temperature below —28° F. (boiling point of ammonia at atmospheric pressure). A solution of acetylene and diacetylene polymers in ammonia is formed. The offgas from the acetylene absorber consists largely of hydrogen and carbon monoxide with less than 1% of acetylene. This gas with, CO_2 already removed, is therefore particularly suitable for ammonia or methanol or other synthesis. The ammonia-acetylene solution goes to the stripper where acetylene is driven off.

● The boiling point of ammonia is between that of acetylene and the diacetylene polymers. Therefore these polymers remain in solution until they are removed from the bottom of the ammonia separation column (first column in the solvent purification section).

Solvent recovery . . . Acetylene absorber offgas is vented to a scrubber for removal of entrained ammonia. Acetylene from the stripper goes through a scrubber to remove traces of ammonia. It is stated that acetylene off 99.8% purity can be obtained. Acetylene stripper bottoms are a solution of diacetylene polymers in ammonia. These polymers are removed from the ammonia in the first ammonia column. Ammonia solutions from the bottom of the two scrubbers in the solvent recovery section can be taken to the second ammonia column to concentrate the ammonia. Ammonia is refrigerated and recycled to the absorber.

Economics

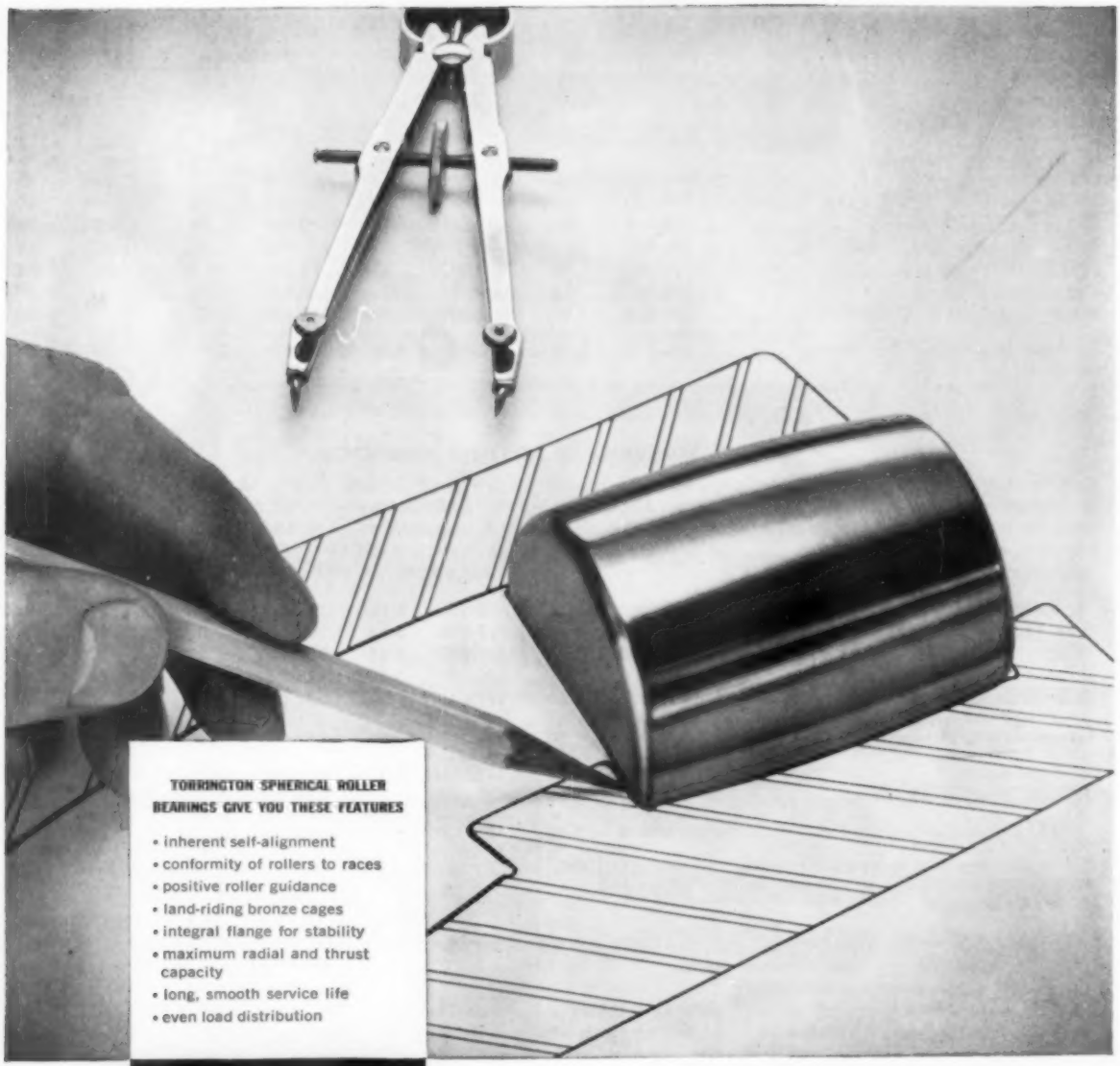
Data are presented in Tables 1 and 2 for a number of cases covering both natural-gas and naphtha feeds. Other feed stocks such as propane or natural gasoline might be economically favorable in certain locations. If costs of feed stock are excluded, a plant using liquid feed has lower investment and operating costs than one using natural gas. High-purity acetylene can also be made from the heavier feed stocks.

Ethylene-acetylene . . . There has been speculation recently with regards to setting up a plant for coproduction of ethylene and acetylene. Note that ethylene would be vented in the offgas from the absorber. Low-temperature ethylene fractionation facilities can be installed for recovery of pure ethylene.

● The Type II burners at Marly have been operated under conditions resulting in ethylene/acetylene ratios ranging from under 0.1 to over 3.

The Houilleres du Bassin de Lorraine SBA-process plant, now under construction in France, will use natural gas as feed. This plant has a capacity of 20 tons per day of acetylene.

Cost data and other information on SBA was furnished by the M. W. Kellogg Co.



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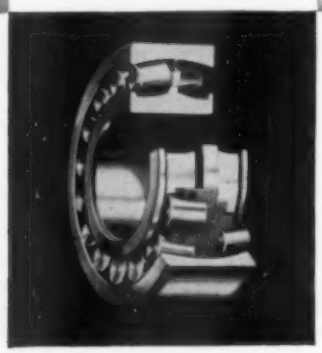

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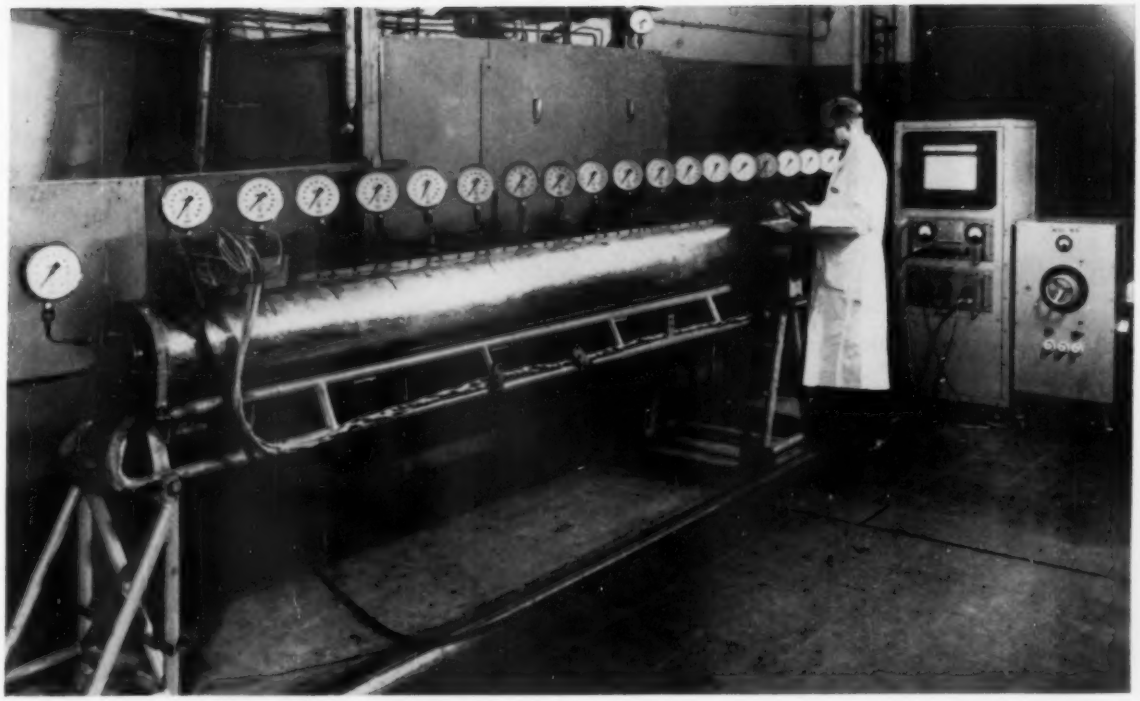


The experiments carried out in this tube may provide the means for . . .

50% recovery by fire drive

BY V. S. SWAMINATHAN
London

STANDARD METHODS of oil production in vogue are capable of recovering only a small proportion of the petroleum present in the formation. In many cases the high viscosity of the oil prevents it from flowing to the bore hole from the porous earth formations in which it is present. This flow occurs under the influence of a driving pressure, such as that of natural gas dissolved in the oil, or of water encroaching from adjacent regions. The greater the viscosity of the oil, the slower will be the flow, and the more difficult the recovery. With heavy, thick crude oils it may not be possible to win more than 10% of the petroleum present in the reservoir.

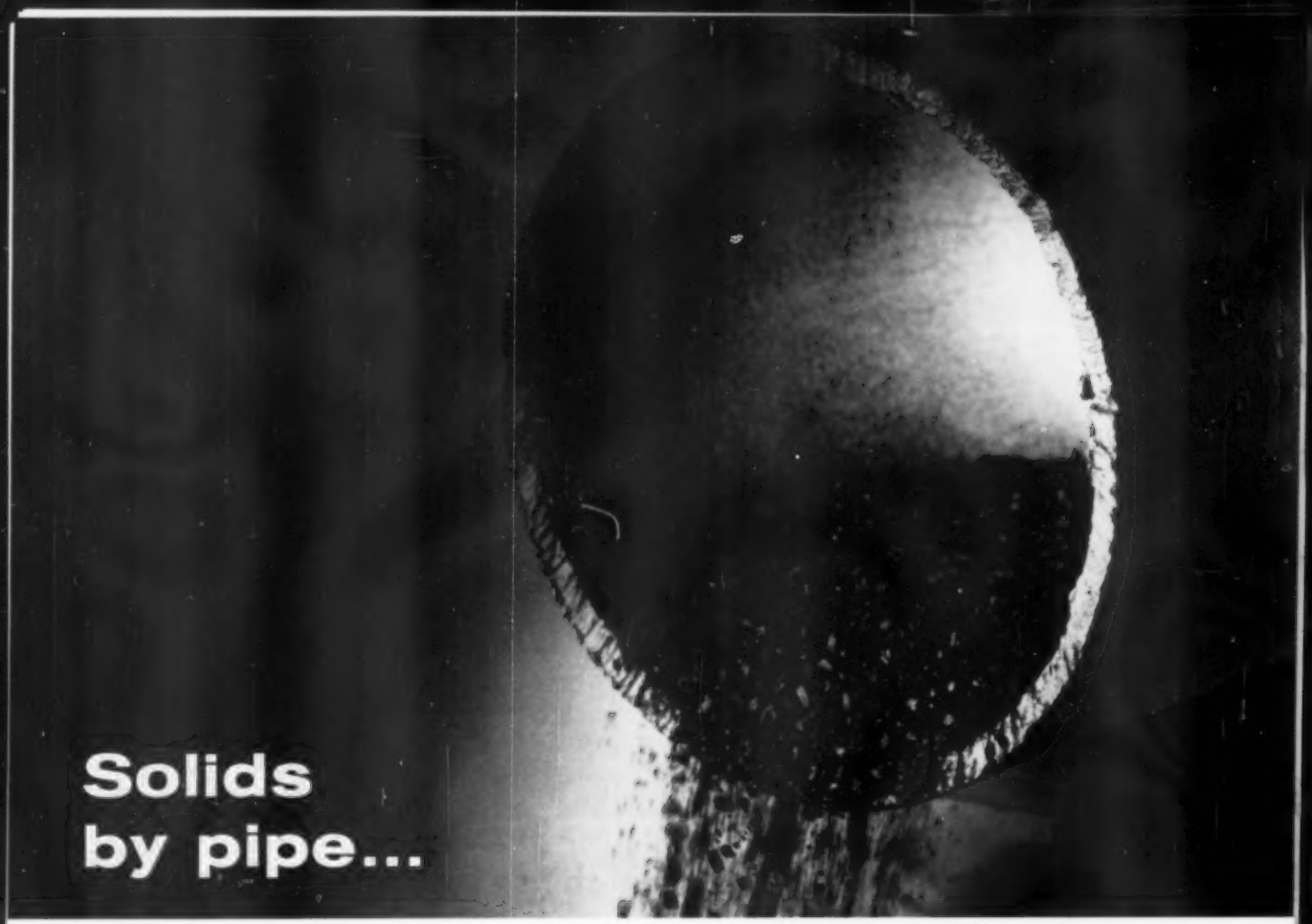
Oil men, who have investigated this major recovery problem in the past, have considered ways and means of reducing the viscosity of the oil, mainly by heating the underground formations. The use of hot gases and hot water appears to offer good prospects, and experimental studies are under way with these methods. Various laboratories, including that of the Royal Dutch-Shell in Amsterdam, Holland, have been preoccupied with a novel technique whereby heat is derived from underground combustion of part of the petroleum itself, which is best designated in situ combustion, or fire drive.

Combustion is impossible without oxygen, and air is therefore injected into the bore hole, the resulting combustion gases and crude oil escaping through another hole drilled some distance away. After the oil has been ignited by electrical means near the air-injection point, the hot burning zone moves gradually in the direction of the production hole.

Promising results have been obtained in experiments simulating this technique in the Amsterdam laboratories of the Royal Dutch-Shell Group. Here the apparatus used is a large horizontal chromium-nickel steel tube, provided at frequent intervals along its entire length with thermocouples and pressure gages. In the experiments the tube was insulated with a thick layer of rock wool to prevent heat losses, and was filled with a mixture of oil, sand, and water, similar in composition to those found in underground oil strata.

The mixture in the tube was locally preheated electrically, and after the temperature had risen sufficiently, the hot oil ignited spontaneously on the admission of air. The oil is forced forward by the gases, the slowly advancing combustion zone driving it onward in a so-called "oil bank"—a sharply defined area where the oil tends to be concentrated. This bank gradually moves to the end of the tube, and oil is thereby recovered from the mixture.

Confirmation of what goes on in-



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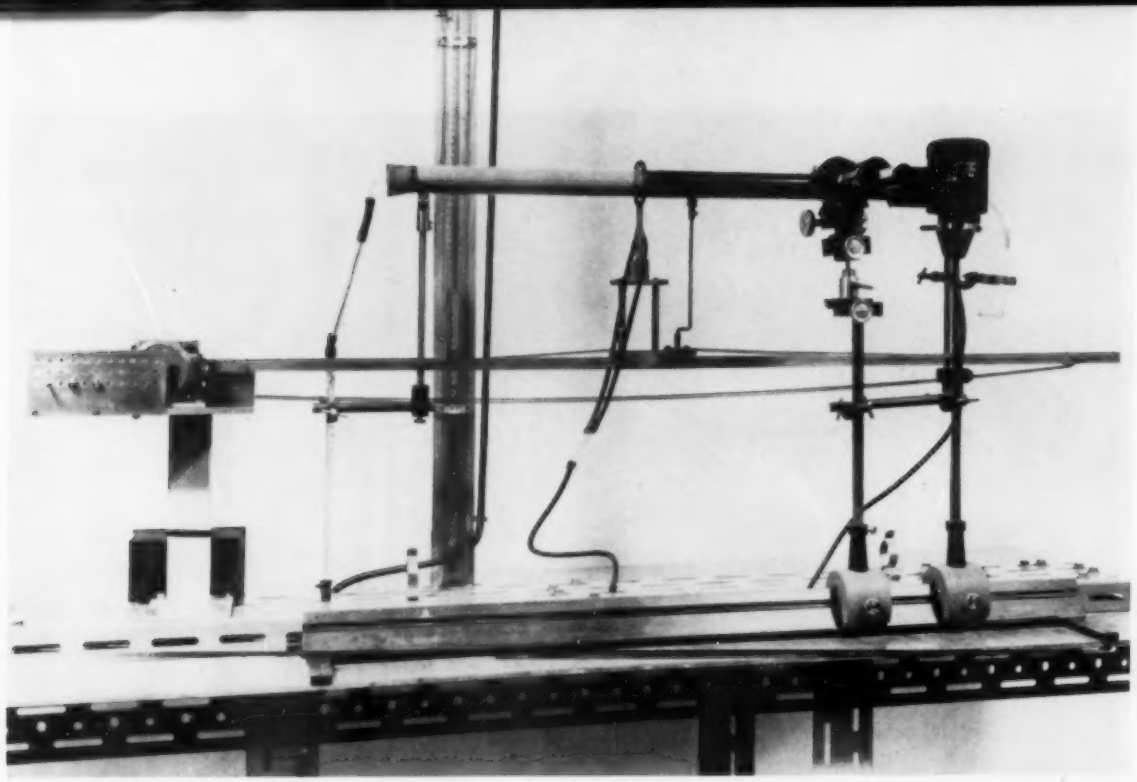


VISUAL OBSERVATION of the fire-drive experiments were made with this glass device at Shell's Amsterdam laboratory. This is a smaller edition of the large chrome-nickel steel tube used for the regular experiments.

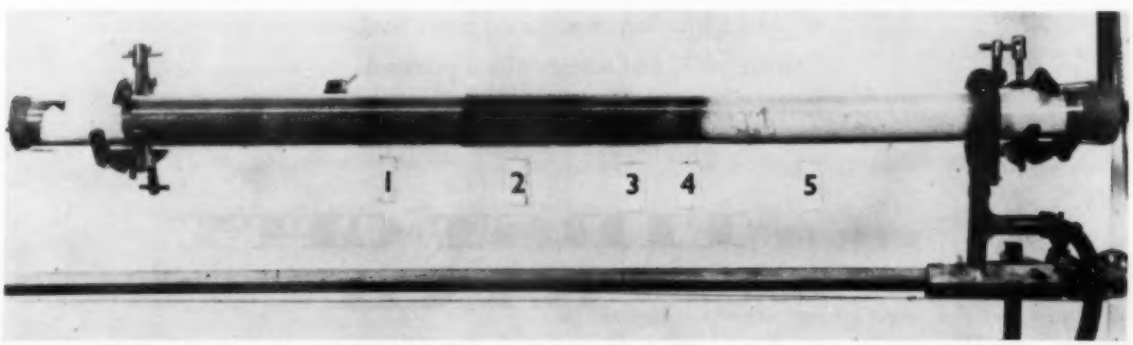
side the tube has been obtained by carrying out similar experiments in a tube of heat-resistant glass, which enables the observer to note the progress of the test. When the combination process is initiated by heating one part of the tube, and air is passed through the apparatus, the combination front is seen moving slowly forward, leaving clean burnt sand behind. In the glass apparatus this flow can also be examined with a microscope.

These experiments have attested that the oil travels forward in a "bank," and that the combustion temperature is low (of the order of 300° C.). The spaces between the grains of sand are far too minute for the flame to be formed (one excellent reason why sand is a good fire extinguisher) but the reaction between the oil and air is nevertheless sufficiently energetic for the combustion process to be self-sustaining.

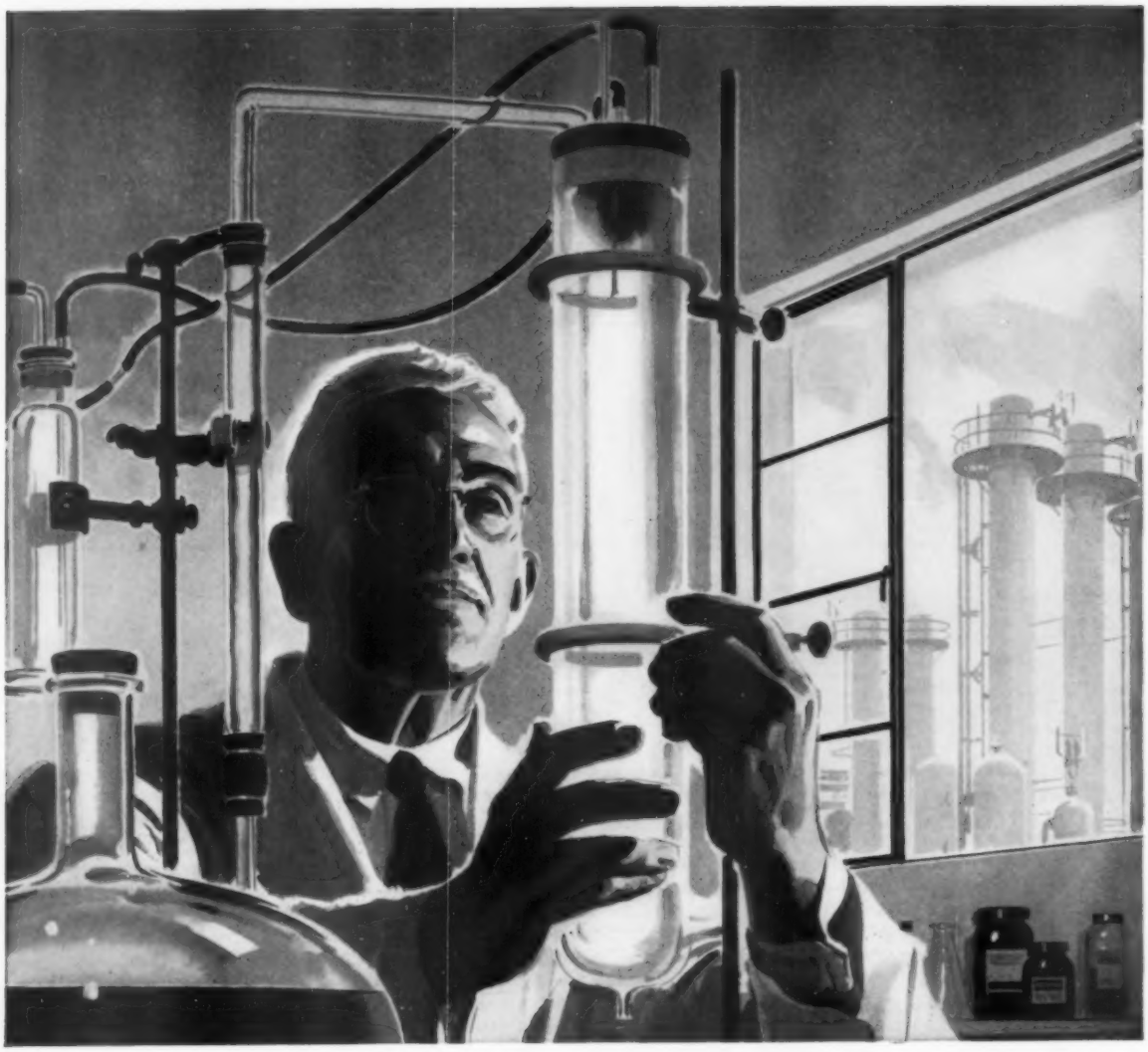
Obviously, conditions under the ground are less favorable for the recovery of the oil than they are in the simple laboratory equipment described above. The pattern in which wells are drilled in an oil field produces the so-called "dead corners," which are not reached by the combustion front, and which, therefore, do not yield up their crude oil. It has been reckoned, however, that approximately 50% of the petroleum originally present in the formation may be recoverable by this technique, with some 10-20% being burned underground.

This in situ combustion process, particularly suitable with heavier crude oils, should make it feasible not only to obtain higher production from new fields, but also to revert to fields which have been exhausted in the past, and to oil formations which have hitherto been regarded as unworkable.

A group of oil companies, including Shell, is presently carrying out an experiment with fire drive in a corner of a California field, and the Royal Dutch-Shell Group is planning to extend similar trials to some foreign fields as well. The results of these experiments will be awaited with great interest, since if they prove successful proved and recoverable reserves of petroleum the world over would go up substantially.



DURING COMBUSTION, various zones can be distinguished in this glass tube. They are: (1) virgin oil sand, (2) oil bank, (3) transition zone, (4) combustion zone, and (5) clean, burnt sand.



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Maintaining Ethanolamine

Part 5 (Conclusion)

Elements of

FIELD PROCESSING

This is the way to reclaim MEA solution

BY J. C. DINGMAIN AND R. P. MONAGHAN

A CYCLE of solution reclaiming is fairly simple. Starting out with a clean kettle, a sack or two of soda ash is introduced to assist in the reclaiming and to protect against corrosion. The monoethanolamine solution is fed to the kettle and brought to the proper level, and steam to heating coils is turned on.

The temperature of the kettle will go up with the increase in solution concentration in the kettle. At 300° F., the monoethanolamine concentration will be something less than the theoretical 93% by weight in the kettle. The vapor composition will also be less than the theoretical 63% by weight monoethanolamine.

At this point, the feed to the kettle is stopped and the stripping of the monoethanolamine from the kettle is begun. If steam spargers are available they are put into operation. Otherwise water rather than fresh feed is introduced to maintain liquid level.

As boiling is continued, the kettle contents become diluted and the boiling point drops. Monoethanolamine content in the overhead stream also drops. (At some concentration of monoethanolamine in the kettle, the overhead stream is at such a level of concentration that the recovery obtainable by going beyond this point and stripping the kettle is questionable in terms of economics.)

The steam is then shut off, the kettle drained and flushed with water. Steam spargers in the kettle may be helpful in cleaning. At times, as visual inspection dictates, it may be necessary to enter the kettle and mechanically clean the heating tubes.

Table 1 shows the improvement in properties of solutions after the start of solution reclaimers.

It should be pointed out here that while the solution reclaimer will function as a filter, large volumes of filterable material will impair the redistillation operation and should be removed from the system by filtration as discussed earlier.

Authors are with Jefferson Chemical Co., Houston. From paper presented at California Natural Gasoline Association meeting.

Reclaiming of diethanolamine solution is substantially more difficult than the reclaiming of monoethanolamine. Diethanolamine is less stable thermally than monoethanolamine, and it has a lower vapor pressure than monoethanolamine.

In addition, it is commonly used in refinery gas service where a high degree of contamination results from carbonyl sulfide, hydrogen cyanide, and other sulfur and nitrogen compounds. Occasionally organic acids will be among the contaminants. Such systems do not lend themselves to a simple, flash-type distillation.

While the authors are not aware of any chemical treating combined with distillation-type recovery for diethanolamine, it might be feasible in some cases. In one case studied in the Jefferson Chemical Co.'s research laboratory, an unusually bad diethanolamine solution was subjected to such treatment and good diethanolamine was recovered. However, the yield was low and the cost high, making the recovery an unattractive proposition.

Other approaches to a solution are being made. Prielipp and Pearce[1] have described the feasibility of using ion-exchange resins to remove salts of acids, principally thiocyanate, thiosulfate and formate, from aqueous diethanolamine solutions. It is believed that this treatment is to be subjected to large-scale tests.

The authors do not know of any successful continuous diethanolamine-reclaiming process which is currently in operation.

Conclusions

1. Air and oxygen should be kept out of the system to avoid formation of ethanolamine oxidation products and to avoid the formation of thiosulfates.
2. Organic acids should be kept out of the system if at all possible.
3. Surface active compounds should be kept out of the system. This includes synthetic lubricants, detergent oils, and long chain acids which may form soap in situ.
4. The solution should be checked at regular intervals for the presence of undesirable materials.
5. Excessive temperatures and hot spots should be avoided because they result in undesirable chemical reactions and thermal decomposition.
6. A portion of the circulating solution should be continuously filtered.
7. Where indicated and where possible, a portion of the circulating solution should be continuously redistilled.

References

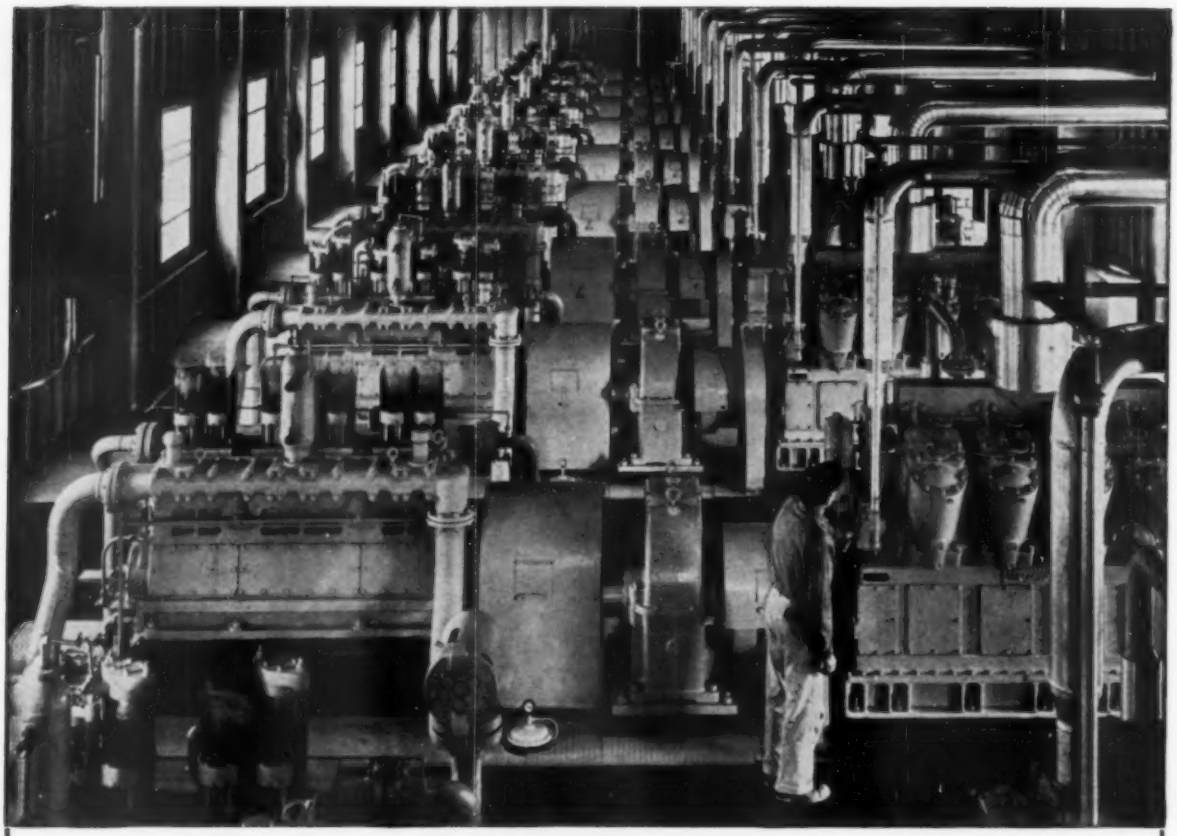
1. Prielipp, G. E., and Pearce, R. L., "Removal of Nonvolatile Acids from Diethanolamine Gas-Scrubbing Solutions by Ion Exchange," 1957 gas conditioning conference, University of Oklahoma.

Authors are with Jefferson Chemical Co., Houston. From paper presented at California Natural Gasoline Association meeting.

TABLE 1—MONOETHANOLAMINE SOLUTION ANALYSES BEFORE AND AFTER RECLAIMER OPERATIONS

	MEA Kjeldahl wt. %	MEA Van Slyke wt. %	MEA Titration wt. %	Residue on steaming wt. %	Iron p.p.m.	Iron acceptance p.p.m.
UNIT A:						
Before reclaiming	22.5	....	17.5	9.7	..	..
After reclaiming	10.5	11.25	11.2	0.6	<1	..
Unit B:						
Before reclaiming	25.3	22.2	21.3	9.8	..	..
After reclaiming	20.3	20.2	20.3	....	..	..
UNIT C:						
Before reclaiming	15.0	13.8	13.8	1.7	2.5	16
UNIT D:						
After reclaiming	15.9	15.5	16.0	0.6	11	14
UNIT E:						
Before reclaiming	16.3	11.2	11.8	0.8	1	45

Note: MEA concentrations "Before" are not related to "After" because of long time intervals between samples.



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MODERN DRILLING

Keys to proper spooling:

- fleet angle
- turnback rollers
- stabilizers

IN ANY hoisting layout it is extremely important that proper attention be given to the fleet angles since this factor influences the behavior of the rope and its ultimate good service.

Through experience it has been proved that an excessive fleet angle may result in abrasion of successive wraps of rope against each other and the rubbing of the rope against the sides of the sheave groove.

Other reasons why fleet angle should be right at all times are: (1) excessive fleet angle on plain or flat drums will cause the rope to wind too close or too open on the first layer, causing crushing, squeezing-in or interlocking of succeeding layers; (2) too small a fleet angle may cause the rope to pile up against flange, then slip off the drum, this being harmful to both the rope and hoisting equipment.

All in all, maintenance of the proper fleet angle should always be given careful consideration in the design or location of new equipment.

On installations where the wire rope passes over a lead sheave (crown block) then on to a plain or flat drum, it is important that the lead sheave be far enough from the drum to maintain a small fleet angle at all times.

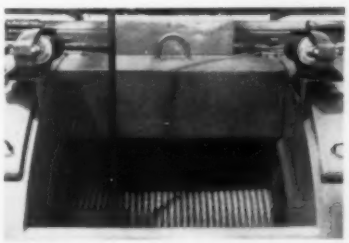
The fleet angle is the side angle at which the rope approaches the sheave from the drum. It is the angle between the center line of the sheave and the wire rope.

Data accumulated from thousands of hoisting units prove conclusively that best wire-line service is obtained from units with fleet angles of 45′ to 1° 15′.

While it is possible to spool the line satisfactorily with the use of turnback rollers or turnback kickers and stabilizers controlled by weight boxes on units with angles less than 45′ and in excess of 1° 30′, it does not result in the best wire-line service possible.

Industrial hoists, using deep grooves, which operate at relatively slow speeds can expect to function satisfactorily with larger fleet angles.

Taken from LeBus-International Engineers, Inc., wire-line-spooling handbook.



TURNBACK roller.

The need for the use of turnback rollers or kickers arises from an improper fleet-angle condition which in many cases cannot be avoided.

If there is fleet-angle problem with the hoisting operation, the use of turnback rollers or turnback kickers is recommended to offset the spooling problem.

The crossover of each layer of line occurs at an exact predetermined point with controlled counterbalance spooling. Turnback rollers can be installed and used successfully to turn the line back when it reaches the turnback point at the drum flange.

Turnback rollers were not always successful when used with helical spooling systems because line does not turn back at the same point on each layer and thus it was often difficult to initiate a proper turnback for the line at each layer on the flange with helical spooling.

With counterbalance spooling, the control of the crossover and turning back of the lines is no problem.

On industrial hoists where rollers cannot be used because of the raising and lowering of a boom hoist, kickers or turnback guide strips can be installed on the drum flanges to make the proper fleet-angle correction.

Stabilizers

Wile-line stabilizers with properly controlled weight boxes are also necessary for good spooling of wire line.

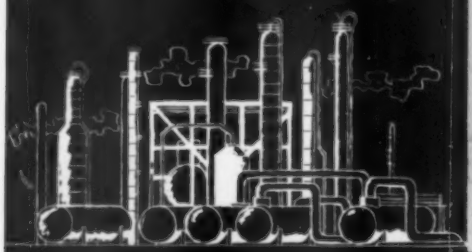
The height of these stabilizers and the stabilizer-weight boxes being well-regulated help eliminate the effects of a bad fleet angle or unlevel and misaligned draw works has on good spooling. Wire-line whip is also eliminated by these properly regulated stabilizers and weight boxes.

WEIGHT BOXES aid proper spooling.

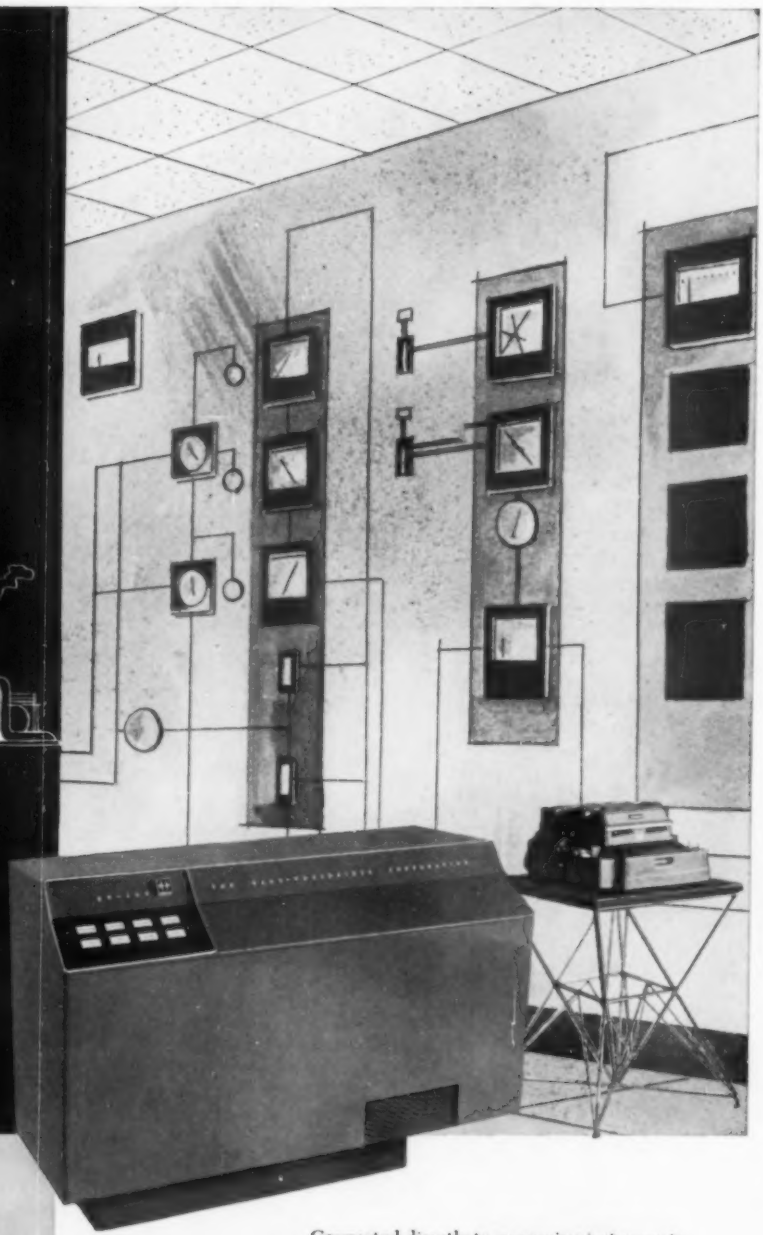
It is very important to check these items carefully whenever the draw works is moved onto a new location, as even a little misalignment of the draw works with the fast sheave on the crown block will require adjustments of the stabilizers, and the amount of weight used in the weight boxes.

The height of the stabilizers above the hoisting drum should be approximately 25 ft. The weight boxes should weigh approximately 60 lb. each. One of these weight boxes is sometimes heavier than the other to counteract a bad fleet angle.

advanced data logging



...with the RW-300 digital control computer



The Ramo-Wooldridge RW-300 Digital Control Computer—the first digital computer designed specifically for automatic on-line process control and data logging—offers significant advantages as the heart of advanced data logging and scanning systems for oil refining, chemical, and other process industries. Unlike conventional data loggers, the RW-300 can be converted to completely automatic control through a minor field modification without purchasing expensive additional equipment and without scrapping any part of the existing logger.

Connected directly to measuring instruments, the RW-300 can do more than log raw or partially processed data. It can also compute and immediately print out more meaningful information such as yields, conversion efficiencies, and energy balances. The RW-300 can also calculate operating guides for plant personnel to follow. In addition to checking process variables against upper and lower limits, the RW-300 can perform more sophisticated checks on process equipment and the process itself. These checks reduce plant maintenance costs by detecting faulty operation of the process in time for corrective action.

For technical information on automatic process control and advanced data logging with the RW-300, write: Director of Marketing, The Thompson-Ramo-Wooldridge Products Company, P. O. Box 45067, Airport Station, Los Angeles 45, California, or call OSborne 5-4601.

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WASTE DISPOSAL—PART 2

The REFINER'S NOTEBOOK

BY C. K. RICE

Test for oxygen demand can be important in

Waste disposal

THE TEST for chemical oxygen demand is somewhat of a newcomer. It has proved itself of great value, particularly in spotting the presence of and the quantity of chemical reducing agents present in the water.

Until not long ago, great stress was placed on the use of biochemical oxygen demand. Gradually, in many instances, the test for chemical oxygen demand is replacing this test.

The results obtained from the chemical oxygen-demand method are not necessarily correlative with biochemical oxygen demand. However, in the case of waste materials from a petroleum refinery, it is believed that the chemical oxygen demand has a great deal more significance.

Some compounds, such as pyridine, are not affected at all by this test. Straight-chain aliphatic compounds are not appreciably oxidized by the chemical oxygen-demand method. To a certain extent this can be corrected by the addition of a silver sulfate catalyst.

However, the silver sulfate will react with halides and any other materials which will react with silver. Branched-chain acids, alcohols, phenolic-type compounds and carbohydrates are readily oxidized by this method.

How accurate? . . . The precision of the method is quite good, but the accuracy depends upon the type of compound being oxidized. The method is not a cure-all for the problem of oxygen-consuming wastes, but it certainly is the most effective and applicable that we have at the moment.

The method for chemical oxygen demand is a dichromate reflux procedure and has been adopted with slight variations by the ASTM,[1] the Federation of Sewage and Industrial Wastes Association,[2] and the API.[3]

The methods as given by these three organizations have been adapted from the analytical method developed by the United States Public Health Service in Cincinnati.[4]

Author is coordinator, refinery technology laboratory, Gulf Oil Corp., at Philadelphia. Paper was presented at WPRA waste-disposal symposium at Wichita.

Chloride

Another test which is frequently required by regulatory agencies, but which is of little consequence insofar as oil-refinery wastes are concerned, is that for chloride. There have been several classic methods in use for many years.

At present, "Standard Methods" prescribes the use of the Mohr method of test.[5] In order to circumvent some of the possible interferences that may be present in industrial waste waters, this book recommends that the sample be acidified, oxidized by heating with hydrogen peroxide, then neutralized before the Mohr method is applied. This is a test that has been long in use. It is also one of the procedures published by the ASTM.[6]

The ASTM has published another method to which it refers as "Referee Method A."[7] This newer method is a mercurometric titration based on information published by F. E. Clarke in 1950.[8] The method can be used to determine all concentrations of chloride, provided that intolerable interferences are absent. Interfering materials which may be tolerated to certain definite limits are zinc, lead, nickel, ferrous, and chromous ions.

To a lesser extent than these, copper, chromate, and ferric ion may be tolerated. Certain reducing agents, such a sulfites, must be oxidized before application of the test.

Of the two methods of test cited, the mercurometric titration probably has the widest application. The precision and accuracy of the mercurometric method appears to be superior to the Mohr procedure.

Many times people have asked whether or not the Volhard method might be used for industrial waste problems. This method could be used but it is more cumbersome than either of the two methods cited. Furthermore, the quantities of interfering materials present in some industrial waste waters may easily affect the results obtained.

Oily Matter

There are as many methods of test for oily matter in industrial waste water as there are definitions for the term "oily matter." Standardization is needed and agreement by all parties concerned as to the objective of the test and the definition of the material being determined.

What is oily matter? . . . Over the course of the last few years, there has been much discussion as to a definition for the term "oily matter." Attention should be directed to the definition which has been adopted as standard by the ASTM.[9] Although this definition may not be completely suitable, it is felt that it is the best of all definitions thus far published.

ASTM defines oily matter as follows: "Hydrocarbons, hydrocarbon derivatives, and all liquid or unctuous substances that have boiling points of 90° C. or above and are extractable from water at pH 5.0 or lower, using benzene as a solvent."

The API has published two methods for the determination of oily material.[10 11] One of these is purported to provide data for volatile and nonvolatile oily material by means of a reflux distillation extraction method.

References

1. ASTM D 1252-55 T, "Manual on Industrial Water," ASTM Special Technical Publication No. 148-B, p. 224 (1956).
2. "Standard Methods for the Examination of Water, Sewage, and Industrial Wastes," Amer. Pub. Health Assoc., Inc., 10th Ed., pp. 333-335 (1955).
3. API 728-53, "Manual on Disposal of Refinery Wastes," Vol. IV, Amer. Petrol. Inst.
4. Environmental Health Center, U. S. Publ. Health Serv., Cincinnati.
5. "Standard Methods for the Examination of Water, Sewage, and Industrial Wastes," Amer. Pub. Health Assoc., Inc., 10th Ed., pp. 60 and 229 (1955).
6. ASTM D 512-55 T, "Manual on Industrial Water," ASTM Special Technical Publication No. 148-B, p. 231 (1956).
7. Ibid, p. 229.
8. F. E. Clarke—Anal. Chem., Vol. 22, p. 553 and p. 1458 (1950).
9. ASTM D 1129-56, "Manual on Industrial Water," ASTM Special Technical Publication No. 148-B, p. 423 (1956).
10. API 731-53 "Manual on Disposal of Refinery Wastes," Vol. IV, Amer. Petrol. Inst.
11. API 732-53, Ibid.

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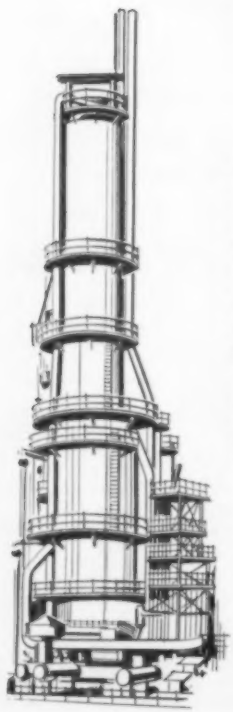

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CARBOLOY®
CEMENTED CARBIDES

GENERAL ELECTRIC

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

Cost of Cooling-Tower Water

FIG. 1 on this page indicates the costs of cooling water and other water suggested or used by numerous authors (over 40). The wide range is not due mainly to inaccuracies but to the wide range of conditions that are encountered. Table 1 and its footnotes indicate the many reasons for a wide range of cooling-water costs.

The cost of cooling towers is discussed in Costimating No. 24 (Jan. 7, 1957, p. 132). Lines and valves cost $21.40 to $31.20 per g.p.m. (1956) and circulation pumps $3.50 to $5.30 per g.p.m. Windage losses from ponds may amount to 10% of the circulation, normal tower losses are 1%, and induced-draft towers may operate with losses of only 0.2%. Horsepower costs are discussed in "Cost of Pumping . . ." (OGJ, July 18, 1955, p. 112). Average 1956 circulated water costs (cents per 1,000 gal.) are about:

0.7 cents—cheap and pure makeup water, 30° F. approach to wet bulb, small makeup, little supervision, and large installation.

1.7 cents—average per 1,000 gal. or about 250,000 B.t.u. (30° rise).

4.0 cents—impure makeup water from deep wells, 6° F. approach to wet bulb, large makeup, small and closely supervised installation.

Katell and Fabor, in their "An Economic Evaluation of Cooling Water Costs," Cost Engineering (Ind. Research Service, Dover, N. H.), (July 1957, p. 70), find the following ranges of 1957 cooling water costs (cents per 1,000 gal.) when the unit power cost is 1 cent per kilowatt-hour:

	Cost
10° F. approach	1.25-1.5
5° F. approach	1.45-1.8

One thousand gallons of cooling water will remove about the following amounts of heat:

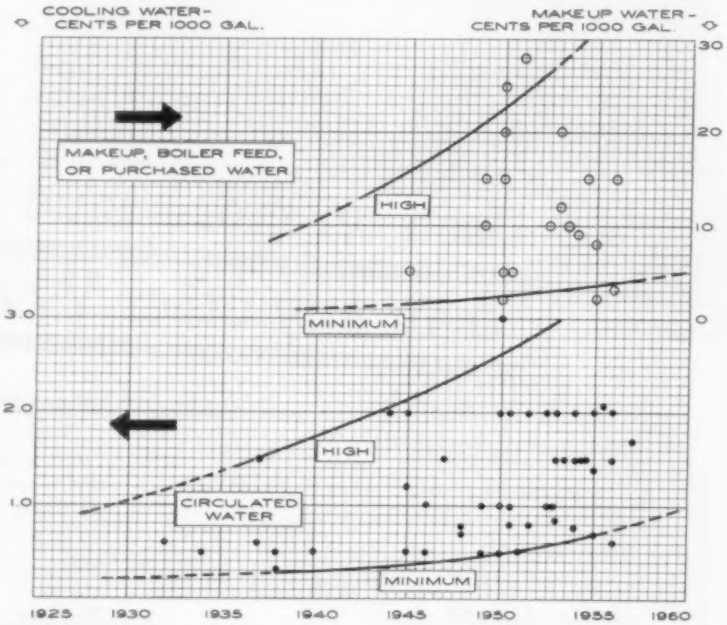
	B.t.u.
10° F. rise	83,280
30° F. rise	250,000

Power is a significant cost and variations in its cost (0.87 cent per kilowatt-hour used in Table 1) can be accounted for by the power requirements indicated in Table 2.

TABLE 2—APPROXIMATE POWER REQUIREMENTS, HORSEPOWER PER 1,000 GAL.

Cooling range (°F. ΔT)	5° F. approach		10° F. approach	
	Pumps*	Fans†	Pumps*	Fans†
15	21-36	24-29	19-34	16-22
25	21-36	29-32	19-34	20-24
35	21-36	35-36	19-34	24-27

*Range used herein. †Nelson, W. L., Costimating No. 24, Jan. 7, 1957, and (lowest values) Katell and Fabor, Cost Engineering, July 1957.



WATER COSTS used in petroleum literature in preparing cost estimates. Fig. 1.

TABLE 1—RANGE OF COST OF COOLING TOWER WATER (1956)
(Cents per 1,000 gallons)

	Conventional open towers		Induced draft		Cooling pond	
	Surface water[1]	Ground water[1]	Surface water[1]	Ground water[1]	Surface water[1]	Ground water[1]
Makeup water[2]	0.06-0.12	0.06-1.5	0.04-0.10	0.04-1.3	0.2 -0.5	0.2 -3.2
Power[3]	0.05-0.33	0.05-0.33	0.09-0.91	0.09-0.91	0.04-0.2	0.04-0.2
Supervision[4]	0.09-0.29	0.09-0.29	0.09-0.29	0.09-0.29	0.09-0.29	0.09-0.29
Total[5]	0.2 -0.7	0.2 -2.1	0.2 -1.3	0.2 -2.6	0.3 -1.0	0.3 -3.7
Total with investment[6]	0.8 -1.6	0.8 -2.9	0.8 -2.2	0.8 -3.4	0.8 -1.7	0.8 -4.4
Total (feed water treated)[7]	0.9 -4.0	0.9 -4.7	0.9 -4.1	0.9 -4.7	.....	.....

1. These affect the cost of makeup water. Surface water involves the construction of reservoirs whereas wells and pumping equipment are needed for ground water. The highest makeup water costs are due to the power required for very deep wells. Approach to wet-bulb temperature and the cooling range affect the amount of water lost by evaporation.

2. Ranges due to windage loss, costs of makeup sources such as surface reservoirs, wells, rivers, municipal supplies, etc., and amount of evaporation.

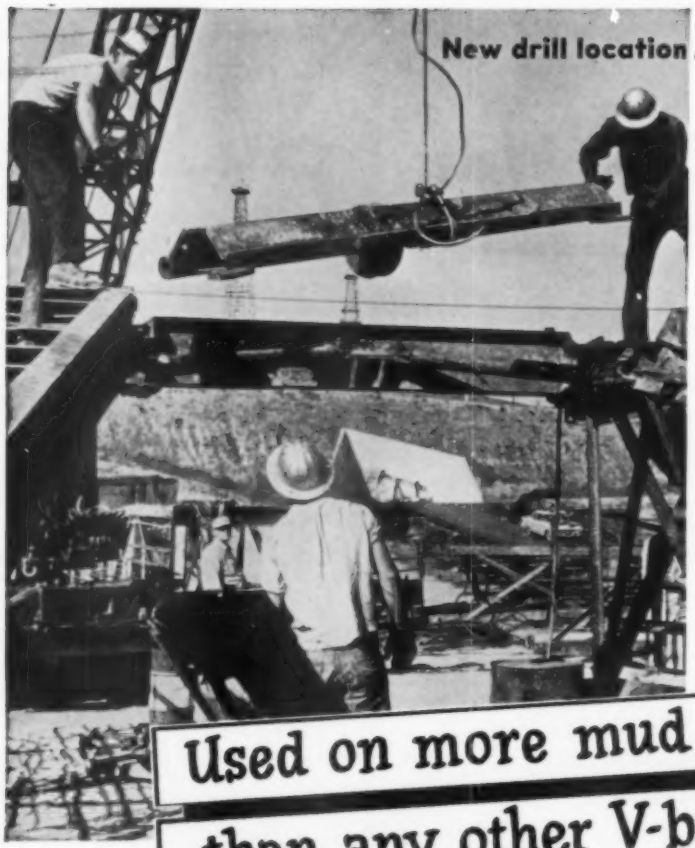
3. Water is pumped in all cases to cooler boxes, exchangers, etc. The power for spray ponds is least, conventional towers next, and induced-draft towers highest. Fuel cost causes the largest variation in the cost of power.

4. The largest installation involve little supervisional cost.

5. The cost of treating chemicals such as bromine, chlorine, etc., is negligibly small.

6. Investment (at 6%) ranges because of the size of tower required (especially because of approach to wet-bulb temperature) but there are also variations in the cost of lines and pumps. Also included is maintenance (3%) and a small amount for insurance.

7. Complete cost including investment, maintenance and treatment of the makeup water. The cost of treating is 5-40 cents per 1,000 gal. of makeup water. This is real treatment of the makeup water, not treatment of the circulated water to kill algae, etc.



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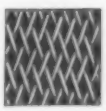
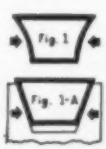


2. Flex-Weave Cover (U.S. Pat. 2519590) A Gates exclusive: provides greater flexibility with far less stress on fabric. Cover wears longer . . . increases belt life . . . more power available to driven machine.



3. Concave sidewalls (U.S. Pat. 1813698) Concave sides (Fig. 1) increase belt life. As belt bends, concave sidewalls become straight, making uniform contact with sheave groove (Fig. 1-A). Uniform contact means less wear on sides of belt . . . far longer belt life.

4. Tougher, more resilient cords are able to absorb the severe pulsations of mud pumps; easily handle peak loads.

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Dixilyn hits triple-producing jackpot in Gulf of Mexico

LEEVILLE, La.—An unusual triple-producing oil well has recently been drilled 12 miles off the coast of this oil-boom community. It reportedly is only the second three-in-one, or triple-producing oil well ever drilled in the Gulf of Mexico.

Drilling the jackpot hole was a new mobile offshore platform which was on its first drilling location, after being christened "Julie Ann" recently in ceremonies at New Orleans.

R. G. LeTourneau, Inc., of Longview, Tex., designed and built the platform, which in effect is a 4,000-ton three-legged island. It is owned by Dixilyn Drilling Corp. of Odessa, Tex., and is drilling for Gulf Oil Corp.

M. O. Boring, Jr., president of Dixilyn, said the three separate strata of profitable oil-producing sands were encountered at approximate depths of 10,275, 10,550, and 11,300 ft. beneath the gulf's floor.

Reports also are that the potential from the triple-producer totals approximately 725 bbl. per day.

THIS new mobile offshore platform hit triple production while on its first drilling location.

Who's getting the drilling contracts

Exeter Drilling Co., Dallas, has contract for the entire group of eight wells to be drilled in Logan County, Colorado, for Shawnee Oil Co. of Denver. The Denver company let contract to Exeter for a series of wildcats in the general Dune Ridge area, scattered over the northeast-southwest trend of more than 12 miles in length. Dune Ridge field is in the center of the trend. The series of eight wells is on farmout from Shell Oil Co. Drilling began in May.

Garvey Drilling Co., Great Bend, Kansas, has contract for a Morgan County wildcat in Colorado's Denver basin. It is Petroleum, Inc. 1 State "L," C NE NE 16-4n-60w. Production will be sought to 6,400 ft. in the "J" sand of Dakota-Cretaceous age.

Bluewater Drilling Co., Lafayette, La., is drilling Austral Oil Exploration Co. 1 OCS-0171, an offshore wildcat in Block 78, Vermilion Parish, Louisiana. Contract depth is 12,500 ft.

Scooter's Drilling Service, Shreveport, has contract for two 5,600-ft. wells for A. J. Hodges Industries, Inc., and Carter Oil Co. One venture is 1-D State, in 27-6n-3e, 1½ miles northwest of Indian Bayou field, LaSalle Parish, and the other is the same operators' 2-D State, in 35-6n-3e, which is a southwest outpost to Indian Bayou field.

Doc Drilling Co., Franklin, La., has contract for Olin Gas Transmission Corp. 1 E. R. Duplantis, confirmation attempt in Sunrise field, Terrebonne Parish, Louisiana. Location is in 34-18s-17e, with contract depth of 12,000 ft.

Holm Drilling Co., Tulsa, has contract for a 5,100-ft. Mississippian wildcat in Bent County, southeastern Colorado. The well is Keith Rising 1 Harrison Estate, C Lot 1, NE NE 4-22s-49w. It was spudded on March 3.

Luccock Drilling Co. has contract for an East Atwood field well in Logan County, Denver basin, Colorado. It is Ginther, Warren & Ginther 2 Carl Lutzman, C NW SW 36-7n-53w. Production will be sought in the Dakota-Cretaceous sand.

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Barnwell Drilling Barge to Go on Sinclair Test

Barnwell Offshore, Inc., Shreveport, is moving its large self-contained drilling barge, "Mister Cap," from Main Pass Block 25 area, in Breton Sound, off the east coast of Plaquemines Parish, Louisiana, to a wildcat location in Block 153, Ship area, 40 miles offshore from Terrebonne Parish in the Gulf of Mexico.

At the new location, Barnwell will drill for Sinclair Oil & Gas Co. and associated companies. Their initial test on this block is projected to 10,000 ft. Location is on a 2,500-acre lease, and is a west extension to prolific multiple-pay production developed by Gulf Oil Corp. and others in Block 154. Sinclair and its associates also have drilled several wells in Block 154 but the Barnwell operation will be their first with a self-contained mobile drilling barge. Location is in 66 ft. of water.

It will be this barge's third well. Its two previous wells were drilled in development of Barnwell's 1,800-acre State Lease 2511 in the Main Pass Block 25 area. Barnwell has three producing wells on this lease, which it has been operating since October 1957.

Black Hills Drilling Co., Newcastle, Wyo., has contract for a Johnson County, Wyoming, wildcat. It is Davis Oil Co. 1 Federal-Baumgartner in NE NW NW 7-51n-77w. It is a 7,200-ft. Parkman-Mesaverde Cretaceous test.

Fortenberry Drilling Co., Natchez, will handle contract for a 4,930-ft. Wilcox wildcat 1 mile south of Wildsville field and 2 miles north of Security in Concordia Parish, eastern Louisiana. The well is Norman Germany and G. W. Gulmon A-1 E. B. Wade, C E½ SE NE 19-7n-7e.

HLM Drilling Co. has a Morgan County, Colorado, drilling contract for W. C. McBride. The wildcat is a 5,750-ft. "J" sand test in the Denver basin. Location for 1 Snodgrass is C NW NW 15-3n-58w.

Loffland Brothers Drilling Co., Tulsa, has contract for The California Co. 1 Government in Wyoming's Lost Cabin gas discovery area. The well, C SW NW 10-38n-90w, Fremont County, is a confirmation try to the Lost Cabin discovery at 1 Spratt on the north fringe of the Wind River basin in remote wildcatting country. The Spratt discovery flowed gas from two Upper Cretaceous zones, and was one of the exploratory highlights of 1957 in Wyoming's Wind River basin.

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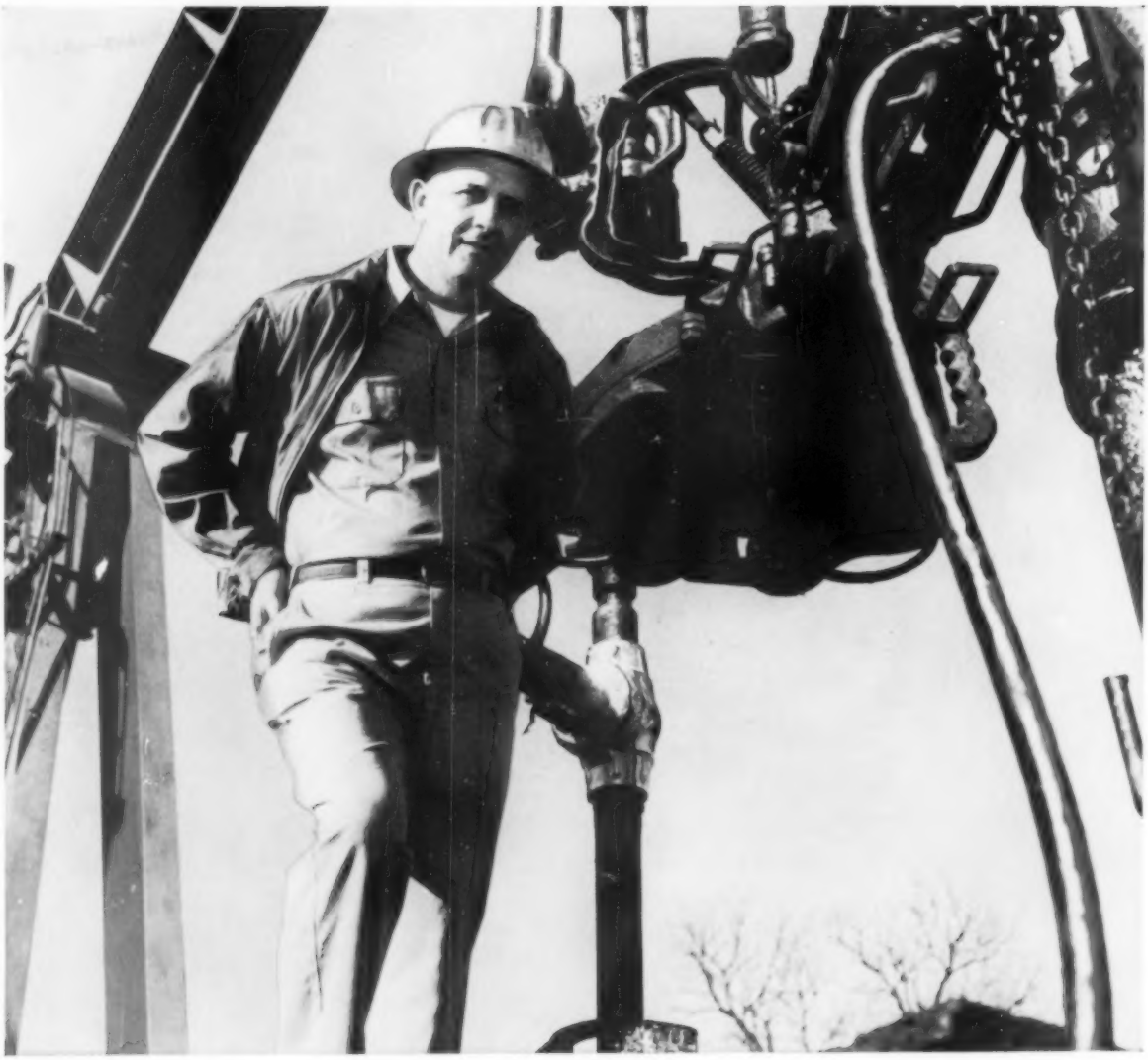

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With so many coating materials on the market, here's a timely report on

Tests for external pipeline coatings

NEW MATERIALS which are now being offered more frequently for use as pipeline coatings have made a coating-testing and evaluation program more desirable than ever before.

Humble Pipe Line Co. has been conducting a laboratory and field program to evaluate and test external pipeline coatings for 10 years. Some of the results are reported here.

Deformation . . . Fig. 1 shows the results of a deformation test as plots of the ratio of the depth of penetration to total coating thickness against elapsed time.

Data in the plot are not complete for the two coatings with glass reinforcement as deformation would continue until the curves flattened out. Curves shown for the enamel and enamel with felt wrap are complete and show the manner in which deformation eventually ceases.

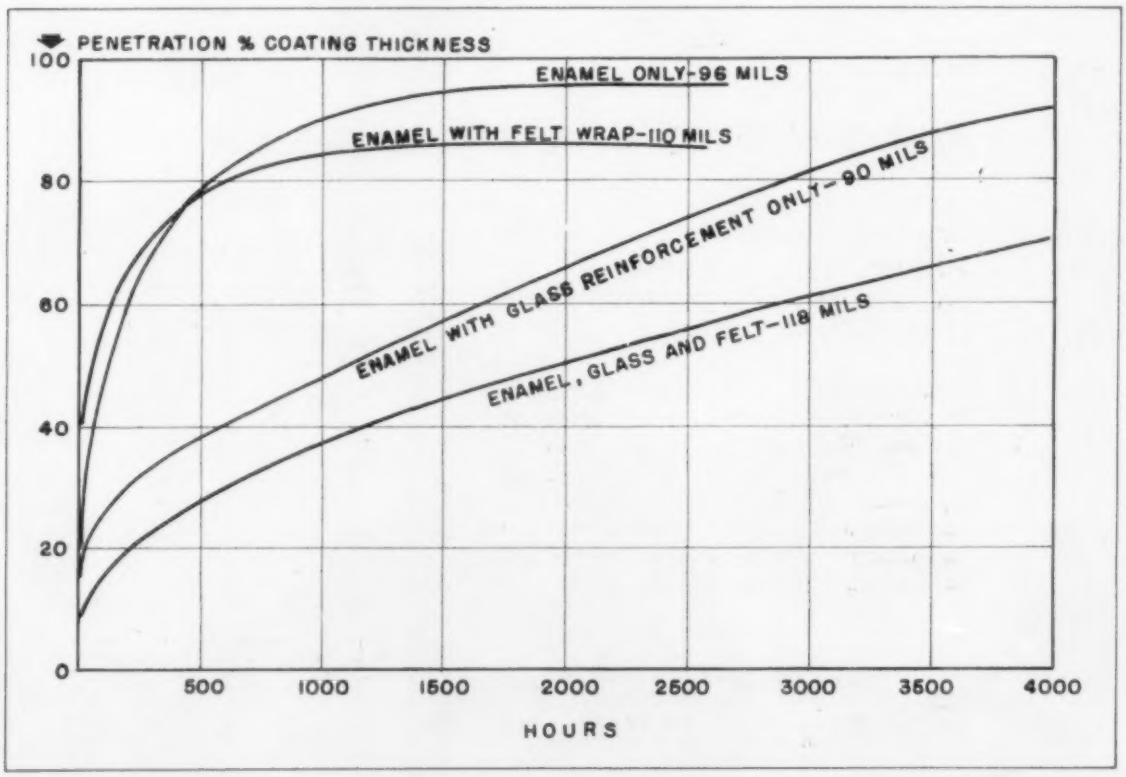
Cathodic protection effect . . . Fig. 2 shows the effect of cathodic-protection currents on coated pipe samples immersed in water. Indications were that applied potential does not cause extensive coating damage until some current begins to flow. Coating damage occurred primarily on those coatings which had initially high conductivity or had holidays.

This is particularly true for the thin coatings. Coatings with low initial conductance, with a few exceptions, have been unaffected by potential for over a year.

Impact adhesion . . . Table 1 includes data on the maximum and minimum values in impact for failure of an enamel-primer combination. Specific

TABLE I—IMPACT ADHESION AT 77° F.

	Ft./lb./ sq. in.
Coal tar enamels with coal tar primers:	
Maximum	0.38
Minimum	0.11
A	0.36
Asphalt enamels with asphalt primers:	
Maximum	3.75
Minimum	0.17
B	1.22
C	1.20
Coal tar enamels with asphalt primers:	
A	0.09
A	0.08
Asphalt enamels with coal tar primers:	
B	0.16
C	0.10



RESULTS of a deformation test show ratio of depth of penetration to total coating thickness, against elapsed time in hours. Fig. 1.

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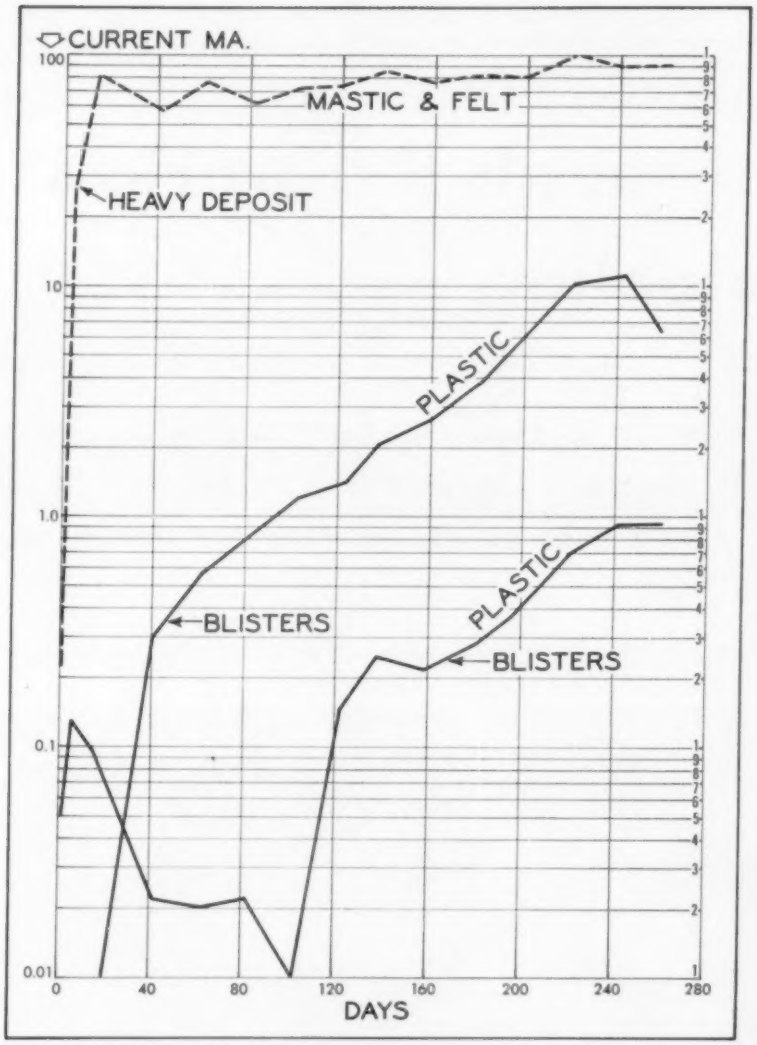

EFFECT of cathodic-protection currents on coated pipe samples immersed in water over a period of about 9 months. Fig. 2.

materials are shown as A, B, and C. In general it was found that the coal-tar enamels fail at lower impacts than do asphalt enamels. However, failure of the coal tar in every case has occurred as parting of the enamel layer itself, indicating that the adhesive strength of the enamel bond is greater than the cohesive strength of the enamel.

TABLE 2—CONDUCTANCE OF PIPE-LINE COATINGS IN OILY SOIL
(Micromhos per sq. ft.)

Days	Enamel A and felt	Enamel B and felt	Enamel C and felt	Enamel D fiberglas and felt
0	0.0074	0.0057	0.137	0.0069
13	0.0212	0.0143	0.274	0.0183
19	0.0228	0.0175	42.2	0.0217
25	0.032	0.024	262.0	0.0217
233	0.148	0.211	5,940.0	38.8
417	2.01	0.964	6,360.0	91.0
450	5.27	1.42	8,900.0	255.0
481	5.27	1.39	7,000.0	200.0
566	5.27	2.09	6,550.0	236.0

Conductance in oily soil . . . Very rapid failure was indicated for some coatings as shown in the data in Table 2. Performance of the hot-applied felt-wrapped coatings in this test agreed with field experience.

In one series of tests on the early tape coatings, however, the laboratory results indicated good resistance to crude oil, but the tapes failed in less than 6 months in field tests in soils with just a trace of crude oil. The lack of soil stresses in this laboratory test gave erroneous results.

This material was digested from "A Coating Evaluation Testing Program," by E. A. Allen, Jr., Humble Pipe Line Co., presented at the fourteenth annual NACE conference, San Francisco.

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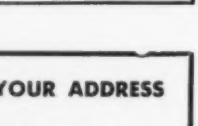

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With 35 Caterpillar-built units in its spread, Majestic Contractors, Ltd., has laid 34-inch at a pace usually reserved for smaller pipe

Seven Cat No. 583 Pipelayers are helping Majestic Contractors, Ltd., lay 1½ miles of 34-inch pipe a day on the Trans-Canada pipeline.

No. 12 Motor Grader and two D7s are used on backfilling operations. The spread includes 35 pieces of Caterpillar equipment—engines, pipelayers, tractors and motor graders.

A Cat D339 Diesel powers this Cleveland ditcher in Saskatchewan. There are nine rugged, heavy-duty Caterpillar Engines at work in the spread.

When finished, the Trans-Canada pipeline will be the longest in the world. It will slash 2,500 miles across Canada, bringing Alberta gas as far east as Montreal.

Majestic Contractors, Ltd., of Edmonton, Alberta, is laying a 100-mile section of the pipe from Burstall to Leinan, Saskatchewan. It is putting the 34-inch pipe into the ground at an average rate of 8,700 feet per day. This equals the rate that smaller big-inch pipe is being laid elsewhere in the industry. In one record 10-hour working day, Majestic welded 305 joints of 40-foot-length pipe.

Spread No. 1, which is setting this pace, is practically all Caterpillar. It includes seven new CAT* No. 583 Pipelayers, the highest capacity machines in the industry; five MD7 Pipelayers; seven D7s; three D6s; two D4s; one D2, and a No. 12 Motor Grader. And Majestic is relying on nine rugged, heavy-duty Caterpillar Engines to power other equipment. There are seven D318s, one on a Cleveland backfiller and six on Bucyrus Erie shovels. In addition, there are two D339 Diesels on Cleveland ditchers.

Right-of-way is 65 feet. The ditch measures 52 inches at the bottom and 90 inches at the top. This is widened to 8 feet, 4 inches in sandy terrain. Here the No. 583 Pipelayers stay 10 to 12 feet from the 6-foot-deep ditch to lower the 150-pound-per-foot, 34-inch pipe. All pipe is being cradled in immediately following the doping and wrapping operations.

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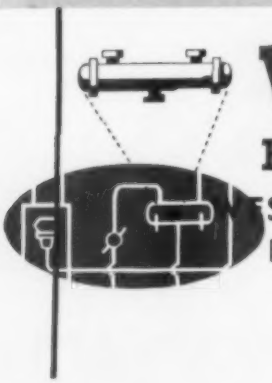

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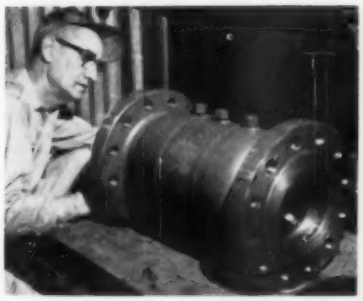


NEW VALVE invented by Orville Watson, Missouri division master mechanic, Service Pipe Line Co., guards against overpressuring the line. The valve was fabricated in the service shop in Tulsa for use on the main line between Freeman and La Plata.

New valve guards against pressure

ORIGINAL development of the automatic self-energizing valve arose from the need to remove a positive-displacement pump from pumping operation automatically, to prevent overpressuring of lines when intermediate booster stations shut down during closed-system operations.

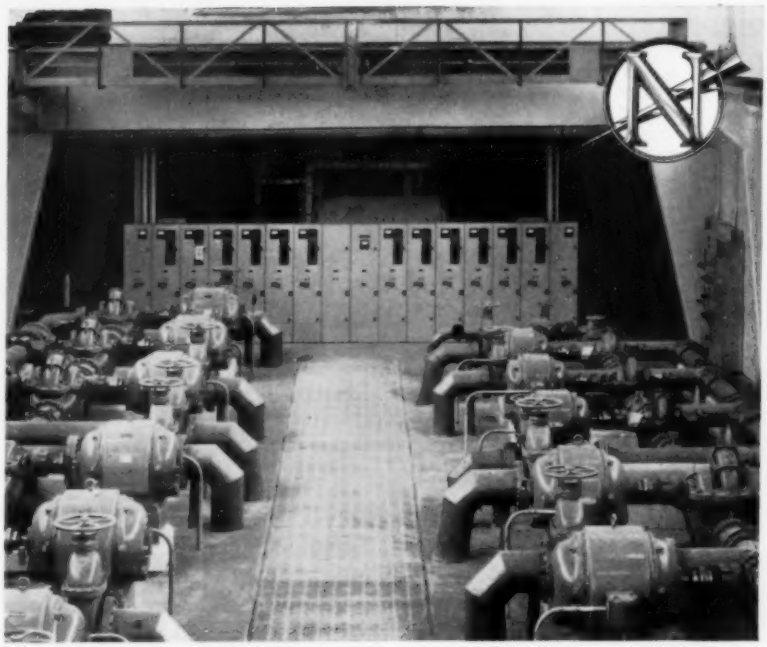
The valve can be activated manually or with pneumatic, hydraulic, or electric controls; by intelligence over wire line or microwave from the intermediate booster stations; or from pressure indication at the originating location.

Actually, the valve as now used for a pump bypass is an overriding safety protection especially necessary when large reciprocating units have inadequate speed range to reduce pressure to a safe point during closed-system operations.

Tests conducted with appropriate instrumentation on this type of application indicate that the valve can be used for many control purposes as well as for any shutoff application where the product flow is always in the same direction.

No auxiliary or outside source or power is required for closing or opening the valve. Only the line pressure of the product being handled is needed for power to actuate the valve.

It is adaptable for use in many applications where automatic or manual-flow control is needed and can be made in any size or pressure requirement to suit the purpose. It can be made in angle, globe, or in-line pattern. The angle and globe type can be serviced without removal from line.



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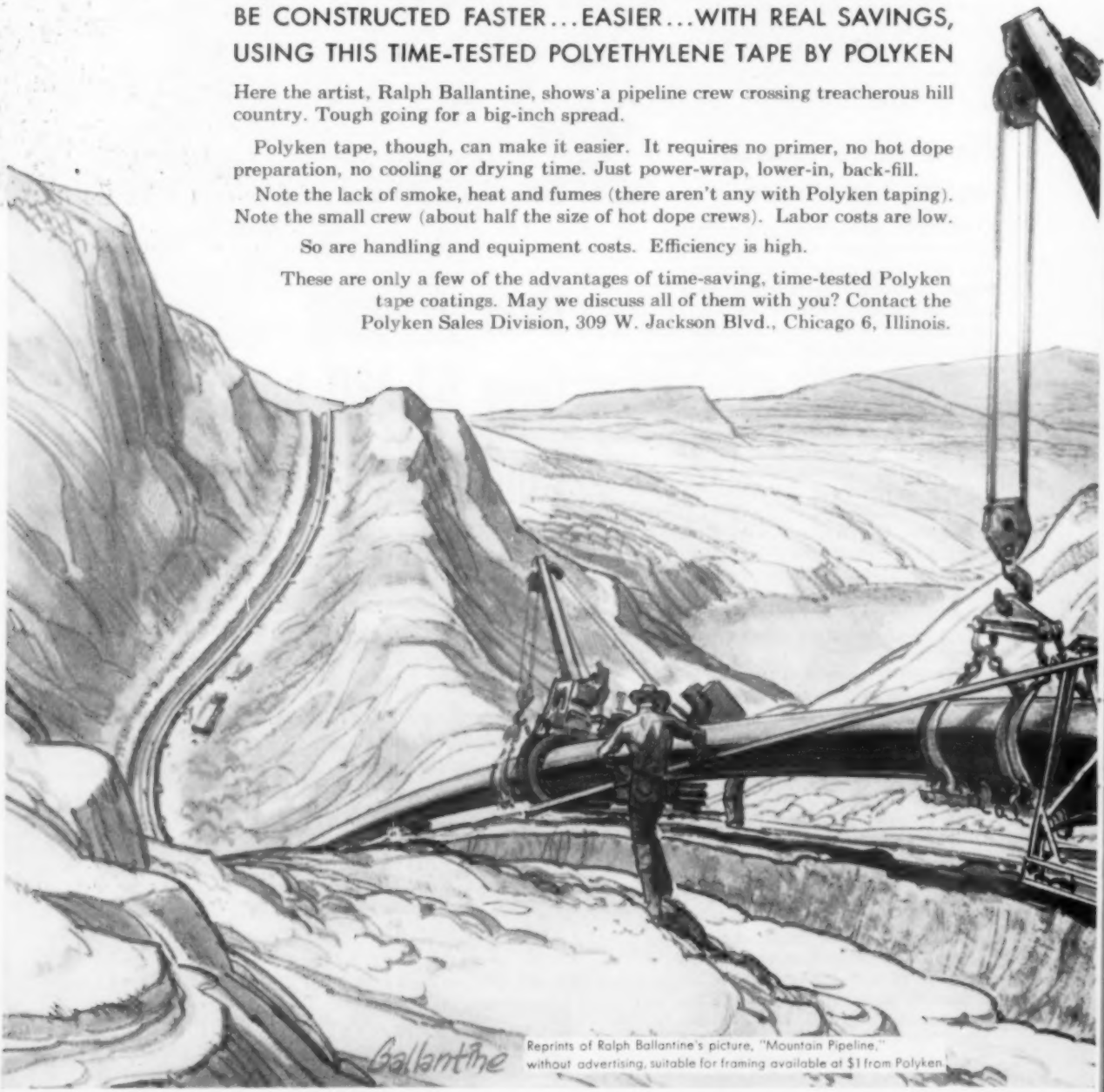
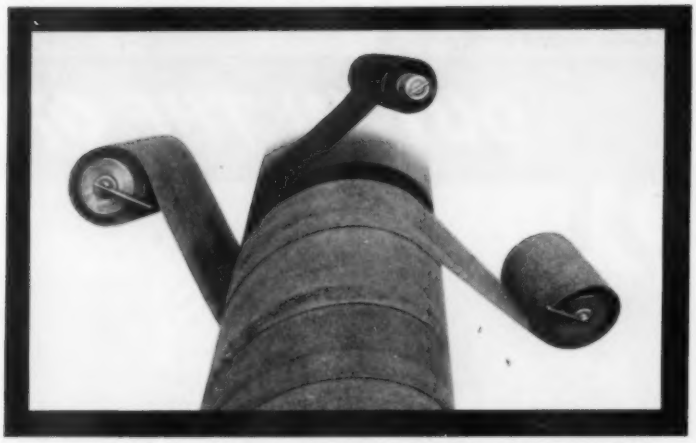


Reprints of Ralph Ballantine's picture, "Mountain Pipeline," without advertising, suitable for framing available at $1 from Polyken.



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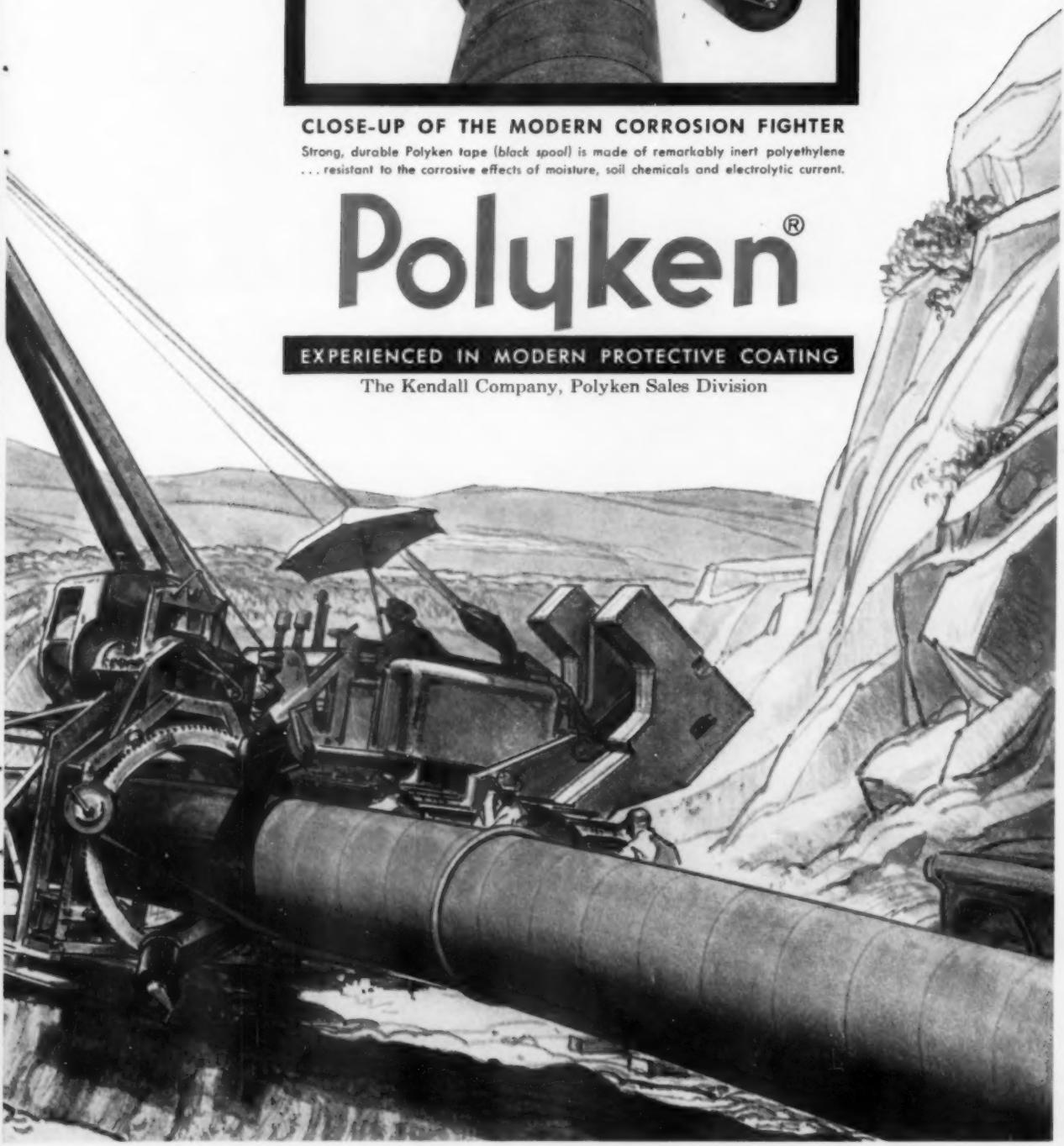

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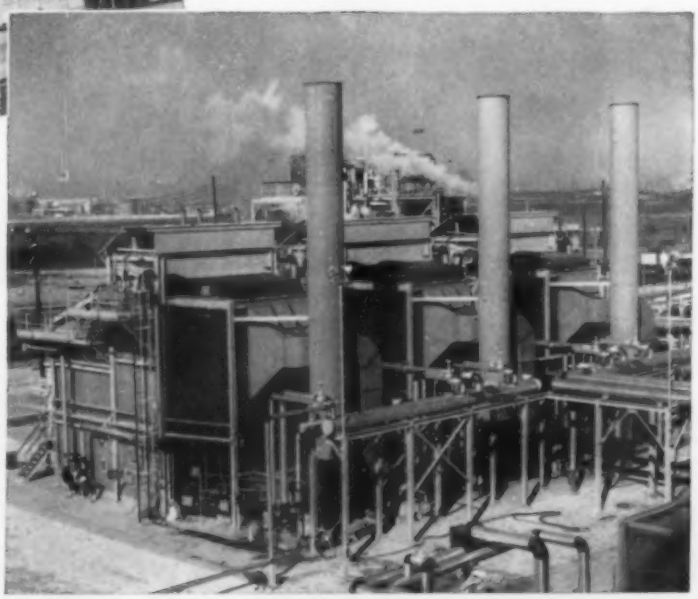

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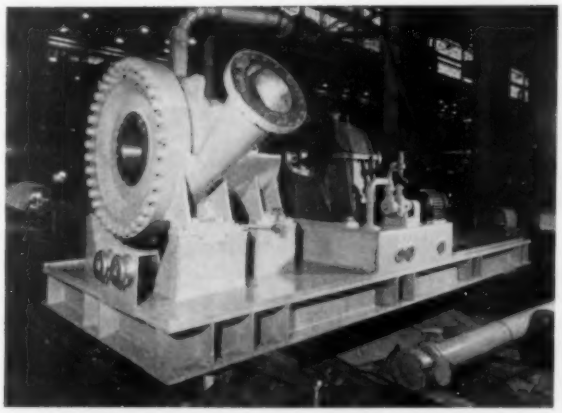

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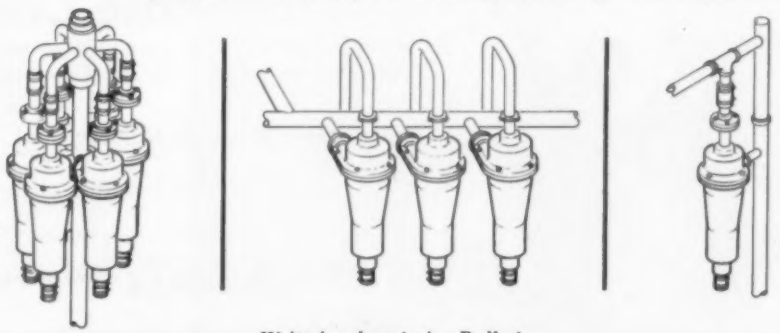

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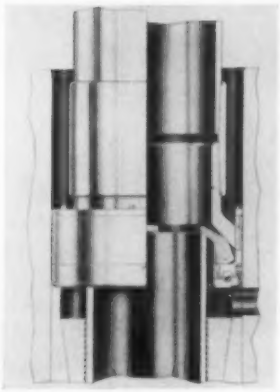
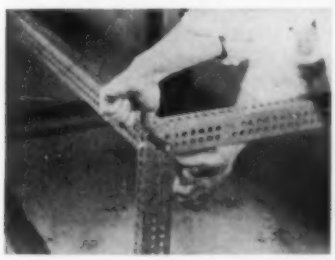


New tool cuts casing

. . . to close tolerances. Designed for cutting internal-casing strings, it's used with Cosasco one-piece unitized wellheads. The rotary table powers the cutter.

The hollow cutter fits over the casing and is lowered against the wellhead spider. A torque tube-drive sleeve connects the cutting tool with the rotary-table slips. Four or more carbide-tipped knives make a clean beveled cut. The cutting operation is performed on the outside of the casing so parts won't fall down the hole. Cutting is done directly below the rotary table. Two types of the overshot casing cutters have been developed—down hole and up hole. **Write or call: Cosasco Div., Perfect Circle Corp., 11655 McBean Drive, El Monte, Calif., for details on casing cutter.**

●



Steel framework assembles

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To construct a framework, merely cut the appropriate lengths and bolt them together through the prepunched slots.

When an original assembly has served its purpose, it can be unbolted and used again. Short or leftover lengths can be joined for use as braces and cleats. The material is inhibited against rust and finished with a coating of grey, baked-on enamel. **Write or call: Republic Steel Corp., Berger Div., Department SB, 1038 Belden Avenue, N. E., Canton 5, Ohio, for details on all-steel framework.**

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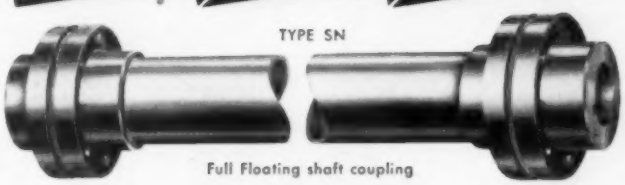

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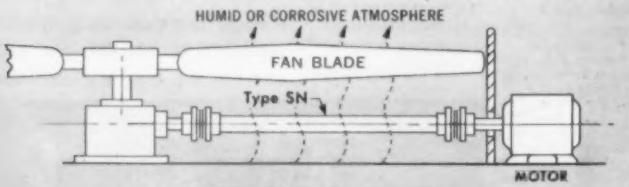


COOLING TOWER INSTALLATION

In the typical cooling tower installation shown above, the motor — outside the humid or corrosive atmosphere — is connected by a floating-shaft coupling to the gear box under the large slow-speed, horizontal-blade fan.

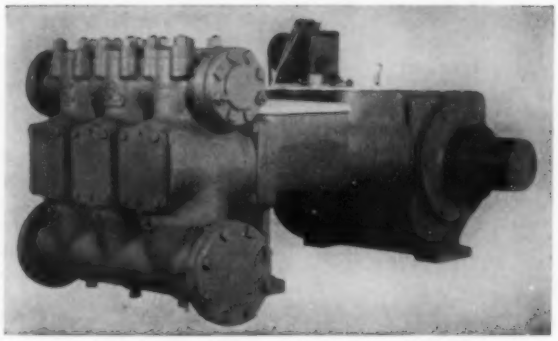
Write for engineering catalog 51A, and the name of your nearest Thomas representative

THOMAS FLEXIBLE COUPLING COMPANY

WARREN, PENNSYLVANIA, U.S.A.

SHOWCASE . . .

New Equipment

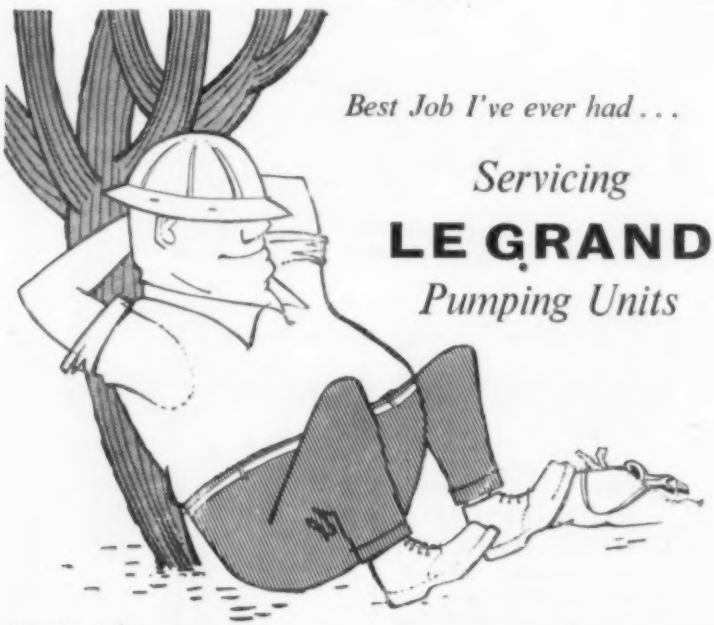


Plunger pump made bigger

. . . to supply a higher delivery volume. The pump is a 6-in. triplex type designated P-600. Features include an offset crankshaft for long bearing life; small discharge valves to reduce hammer; large suction valves for positive filling; and deep stuffing boxes for force-feed lubrication and long packing life. Ten plunger sizes are available ranging from 1¾ to 4 in. Cartridge type of cylinder-head stuffing boxes allow easy access and maintenance.

Rated at 160 hp., the pump is capable of delivering pressures to 3,500 psi. and volumes to 11,700 bbl. per day at speeds to 350 r.p.m. **Write or call: Frank Wheatley Pump & Valve Mfg., Box 1948, Tulsa, for details on triplex plunger pump.**

●



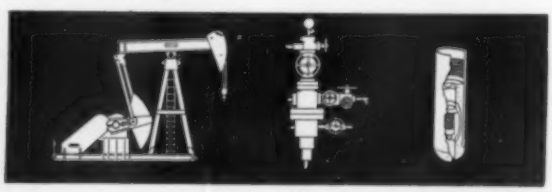
Best Job I've ever had . . .

Servicing

LE GRAND

Pumping Units

These rugged, dependable Le Grand 'L' Series Units are the latest developments in operation anywhere in the world. Engineered from years of oilfield experience, they can be counted on to give long, non-stop operation with the very minimum upkeep. Units available are from 3,000 lbs. to 33,000 lbs. polished rod load and 24 in. to 132 in. stroke. Also available: Le Grand OCT. Wellhead Equipment; Le Grand-Howco Floating Equipment; and Le Grand-S. C. Carter Long-stroke Hydraulic Pumping Units, Davey Compressor Light Rotary Air Drilling Rigs.



Also represented in the following countries:

CANADA
Le Grand Ltd.,
111-58th Avenue
South West
Calgary, Alberta.

TRINIDAD
Industrial Agencies Ltd.,
14, High Street,
San Fernando,
Trinidad, B.W.I.

VENEZUELA
Eastern
A-Z Export, S.A.,
Apartado 4026,
Puerto La Cruz,
E. Venezuela.
Western
A-Z Export, S.A.,
Apartado 304,
Maracaibo,
W. Venezuela.

IRAQ
Le Grand, Sutcliff and Gell Ltd.,
Attar Street,
Karrada Sharquiyah,
Baghdad.

For full details, please write to:—

LE GRAND ROCHESTER LIMITED

HORSTED AIRPORT · ROCHESTER · KENT · ENGLAND

Telephone: CHATHAM 44626

Machine cuts holes in pipe

. . . at pressures to 1,440 psi. at 100° F. and 1,250 psi. at 500° F. The automatic, high-pressure drilling machine makes cuts with diameters of 2 through 6 in. in any type of pipe, the maker says. Designated the CH-6, it is intended for use on distribution systems and transmission lines and in refineries and petrochemical plants where connections are required under pressure.

It is designed to make cuts into high-pressure gas, oil, water, or steam lines. The machine features direct-reading tool position and feed indicators and automatic disengagement of the tool feed.

The machine may be operated by hand with a ratchet handle or power driven with an air motor or gasoline engine. No changes in the machine are required for either hand or power operation. **Write or call: Mueller Co., 512 West Cerro Gordo Street, Decatur, Ill., for details on CH-6 automatic, high-pressure drilling machine.**

Have You Ever Read The Small Print To Really See

What's In A Guarantee?

Let's Examine An Average Guarantee

Most guarantees sound about alike. Although the wording may be slightly different, they usually have about the same meaning and give the same protection.

The average warranty or guarantee is fine, as far as it goes. But how much protection does it really give the buyer? Let's analyze the "fine print" in an average factory warranty and see!

First, the average warranty or guarantee simply sets forth that the equipment is guaranteed in event of defective materials or workmanship. The warranty is not a guarantee to the buyer that the equipment he has bought will do **his** job.

Second, the average warranty is for a specific period of time. What happens to the equipment after that period is the sole responsibility of the owner.

Third, the average warranty . . . in case of a failure that does come within the limits of the guarantee . . . does not cover normal wear in the period the equipment was used, or the cost of installing new equipment.

So, after you boil it all down, the average warranty is chiefly a protection to the manufacturer and carefully limits in detail his responsibilities to the buyer only to the extent of defective materials or workmanship for a specific time.

In the final analysis, the average warranty does not fully protect the buyer. It is primarily a protection to the manufacturer.

Now, Let's Examine A Stewart & Stevenson Guarantee

When you buy an engine or any other product from Stewart & Stevenson Services, you are protected by **two** guarantees . . . the factory warranty against defective workmanship or materials **and** the unquestionable Stewart & Stevenson "guarantee of duty."

There is no fine print in the Stewart & Stevenson guarantee.

We have made it as simple and straightforward as we know how. And here's what it means to the buyer. It means that Stewart & Stevenson Services guarantees your engine or equipment to do the job you bought it to do on your specific application—not just develop a certain amount of horsepower. That's important!

The Stewart & Stevenson guarantee of duty specifies in plain and simple language what your engine is supposed to do on your particular job—to *your* specifications—and this Stewart & Stevenson guarantee is backed up with a provision that if your engine or equipment should fail and we cannot make it perform as specified when you bought it, we will remove the engine at our expense and refund *all* money paid.

Now, in plain language, what does a Stewart & Stevenson guarantee really mean to the buyer? It means this: when you deal with Stewart & Stevenson Services, you have the protection of a guaranteed service policy—plus the manufacturer's warranty—and you know that there is no way in the world for you to buy equipment that won't do your job in the manner you intended.

For more than fifty-five years, Stewart & Stevenson has been practicing this policy . . . a policy of a full measure guarantee and square dealing that has resulted in Stewart & Stevenson Services becoming the largest distributor of General Motors Diesel Engines in the world.

So, when you get ready to deal on power requirements, talk to your Stewart & Stevenson representative. We will plan and engineer your power needs in the shortest possible time and give you a guarantee that will "hold water," and assure that the equipment will do the job you buy it to do!

STEWART & STEVENSON SERVICES, INC.

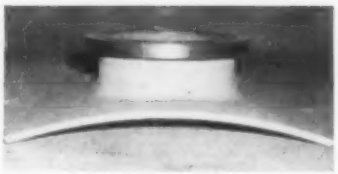
Main Office and Plant: 4516 Harrisburg Blvd., Houston 11, Texas
Phone CApitol 5-5341
Branches: Corpus Christi, Dallas, Lubbock, San Juan, San Antonio, Beaumont, Odessa
Representatives: Longview, Brownsville, Wichita Falls, Freeport
Export: Room 1405, 74 Trinity Place, New York, N. Y.

THE WORLD'S LARGEST DISTRIBUTOR OF DIESEL ENGINES

Pressure tank

. . . has "flued" manways that allow all manway welds to be X-rayed. The high-pressure storage tank with flued manways eliminates overlapping double joints, the maker reports. Tank capacities to 30,000 gal. are available with a working pressure of 250 psi.

The base of the manway is drawn or "flued" from plate that becomes a section of the tank. The result is a smooth, curved, unbroken configuration where the manway enters the tank. The manway section is butt-welded to the rest of the tank.



The tank is built to ASME requirements. Standard manways are 18 in. in diameter. Twenty-inch manways are optional on the larger tanks. **Write or call: Advanced Products Div., ACF Industries, Inc., Milton, Pa., for details on flued manways for pressure tanks.**

New tool for perforation

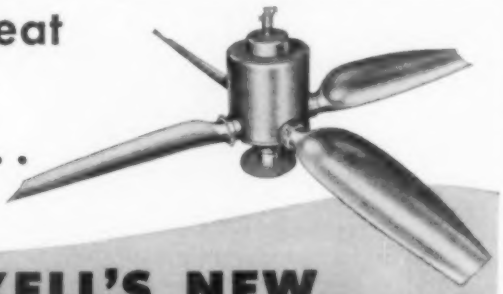
. . . offers choice of three diameters. Called the J-II Slim Jet, it incorporates a jet charge on an expendable, prebent aluminum carrier. The gun may be rigged in 3⅝ and 5-in. o.d. By using the tubing without bending, a 4½-in. o.d. assembly is obtained.

The tool can be used in 4½, 5½, and 7-in. casing with optimum standoff between gun and casing. Shot densities are one to four per foot. Lengths to 100 ft. can be run.

A bottom-firing mechanism allows a bottom-up firing order. This eliminates the danger of shooting the gun in two and leaving unfired charges in the bottom of the hole, the maker says.

Both the carrier and the charge cases are virtually pulverized during firing. Residue is acid soluble and drillable, according to the maker. **Write or call: Western Co., Midland, Tex., for details on J-II Slim Jet.**

for peak heat exchanger efficiency . . .



HARTZELL'S NEW CONTROLLABLE PITCH FAN

The Hartzell Controllable Pitch Fan meets a long-standing need in the petroleum industry for a precise method of controlling a variable flow of air to maintain predetermined temperatures. On test installations, these new fans have proved their ability to hold outlet temperature fluctuation to plus or minus 1½°F. And, while achieving this highly accurate level of control, they consume up to 50% less power than required by conventional fixed-pitch fans.

In a temperature sensitive control system depending on air flow, the amount of air required to achieve the necessary cooling depends on the temperature of the air. High air temperatures require high air deliveries, low air temperatures require minimum air deliveries. With a Hartzell Controllable Pitch Fan, variable air delivery is accomplished by variation in blade pitch setting. The fan assembly responds instantly and automatically to conventional temperature sensitive control equipment — increasing blade pitch to deliver more air when outlet temperature rises, decreasing blade pitch and delivering less air when outlet temperature falls.

For complete details on Hartzell's controllable pitch heat exchanger fan, write for Bulletin 111-B or call your nearby Hartzell field engineer.

HARTZELL PROPELLER FAN CO.
Division of Castle Hills Corp.
72 Thomas Blvd. Piqua, Ohio

Safety hat weighs 12½ oz.

. . . yet gives high protection against penetration from falling objects. Features of the plastic hat include a permanent, nonwrinkle head band, insulation against heat, 15,000 volts dielectric resistance, and a snap-in sling and headband with finger-tip adjustment. According to the maker, the hat exceeds all federal specifications for ruggedness. **Write or call: General Textile Mills, Inc., 450 Seventh Avenue, New York 1, for details on Gentex safety hat.**

CORRUGATED SLEEVE

shields working parts

Consolidated Safety Relief Valve with Sealing Bellows. Type 1900-30 Series, Sizes: 1½" x 2" to 8" x 10".

A durable, two-ply stainless steel Sealing Bellows in Consolidated Safety Relief Valves isolates contaminants, corrosion or viscous fluids from the working parts. The Bellows is balanced with the seating surface. Capacity is less affected by variable back pressure, so you can use smaller discharge piping and reduce the cost of pressure-relieving systems.

Full-rated relieving capacity is certain at all positions of the single blowdown adjusting ring because a fixed maximum secondary orifice provides full lift at 10% overpressure. Even with superimposed back pressure in the relieving system, valve action is consistently positive.

Protection of working parts is but one of many reasons why Bellows Type Consolidated Safety Relief Valves assure absolute protection for personnel and facilities. Write for details, including facts about the Standard valve that you can convert to the Bellows type in your own shop. Ask for Catalog 1900.

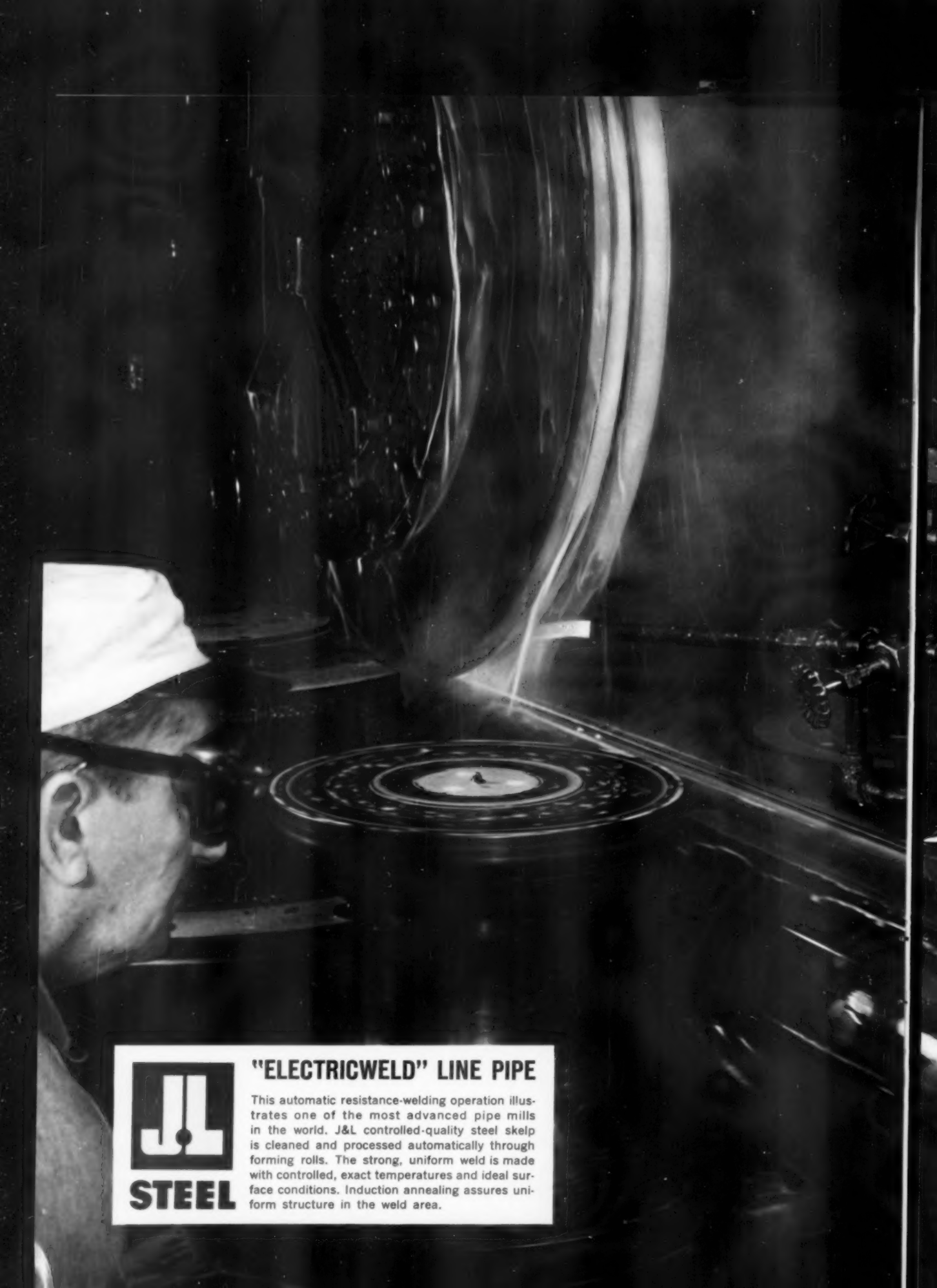
MANNING MAXWELL & MOORE INC. MM&M TRADE MARK

CONSOLIDATED SAFETY RELIEF VALVES

A product of

MANNING, MAXWELL & MOORE, INC.

Consolidated Ashcroft Hancock Division • Tulsa, Oklahoma
In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario



J&L STEEL

"ELECTRICWELD" LINE PIPE

This automatic resistance-welding operation illustrates one of the most advanced pipe mills in the world. J&L controlled-quality steel skelp is cleaned and processed automatically through forming rolls. The strong, uniform weld is made with controlled, exact temperatures and ideal surface conditions. Induction annealing assures uniform structure in the weld area.

J&L'S "ELECTRICWELD" LINE PIPE

every length quadruple-tested for utmost dependability

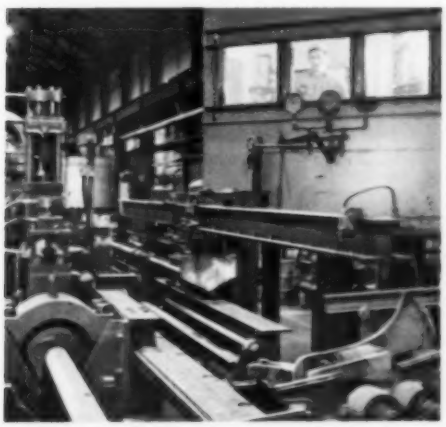
Rigid quality control has top priority in production of J&L's Electricweld pipe for gathering, distribution and transmission lines.

This control will pay off in trouble-free experience in your next purchase of line pipe for transmission or distribution pipelines. Every length is pressure-tested under the specified A.P.I. or A.S.T.M. hydrostatic test requirement both in time and in degree of pressure. Lengths to 60 feet speed installation, reduce number of field welds.

Electricweld line pipe is available in sizes from 6⅝ inches through 12¾ inches O.D. All J&L Electricweld line pipe is manufactured according to appropriate A.P.I. and A.S.T.M. specifications.

In addition to a series of **visual inspections,** each length of pipe is given a **crush test** to determine weld strength and quality of steel. It is subjected to a pressure test on one of the largest and most modern **hydrostatic testers** in the world. As an additional precaution and assurance to the customer, J&L is giving both ends of each joint a **magnaflux examination.**

Field reports on J&L Electricweld line pipe are enthusiastic. Get the facts from your J&L distributor or write direct to Jones & Laughlin, 3 Gateway Center, Pittsburgh 30, Pa.



Hydrostatic test—Every length of J&L Electricweld pipe is tested under sustained pressures. Pneumatic hammers strike pipe while under pressure to build up pressure surge.

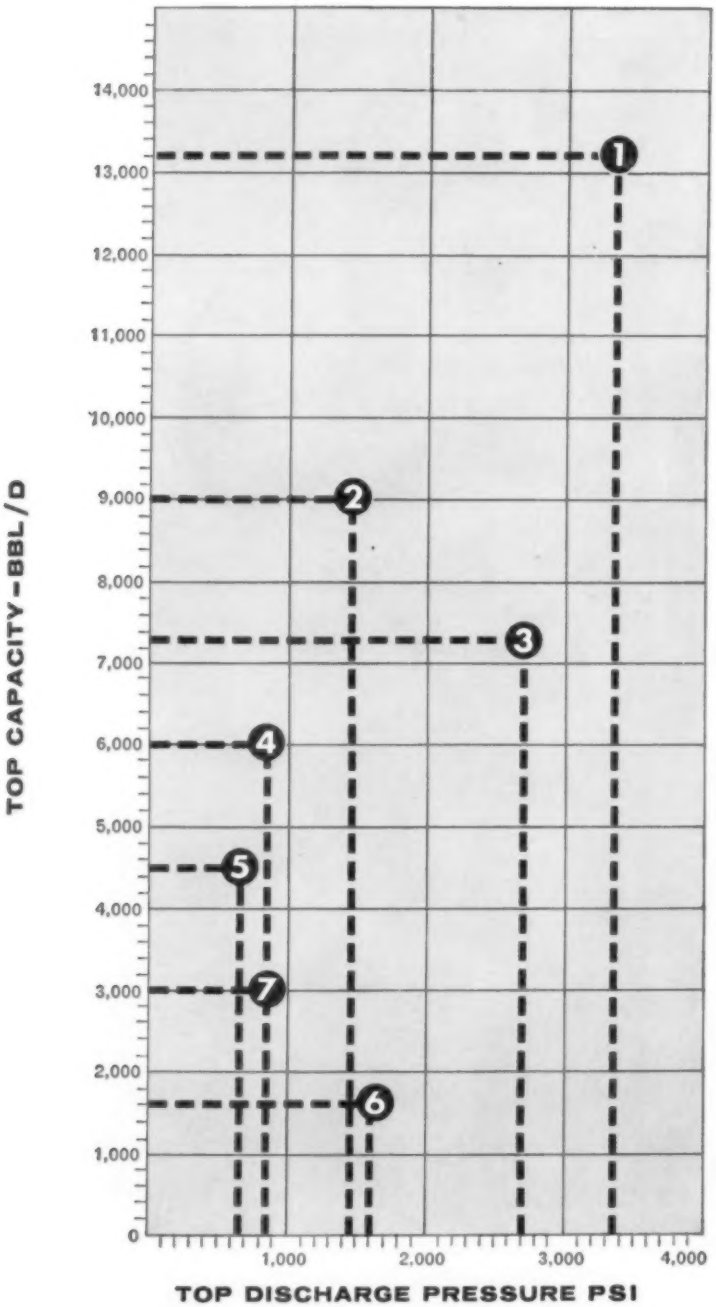
"Crush" or flattening test—This conclusive Electricweld mill control test assures you strong welds and sound steel. It complies with requirements of A.P.I. 5L, 5LX and with A.S.T.M. A-53, A-135 and equivalent specifications.

J&L STEEL

Jones & Laughlin Steel Corporation

PITTSBURGH, PENNSYLVANIA

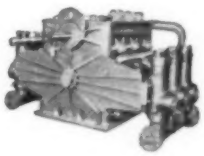
CHART YOUR CAPACITY AND PRESSURE NEEDS
PICK THE GARDNER-DENVER PUMP FOR THE JOB



Draw your capacity and pressure needs from the Gardner-Denver line of quality waterflood pumps. Seven pumps to choose from. All engineered for low-cost, salt water disposal and waterflood service. Write for bulletins.

For higher pressures, consult your Gardner-Denver Representative.

1. PL-7 (240 hp.)



2. PA-8 (160 hp.)

3. PE-5 (75 hp.)

4. FG-FXG (60 hp.)

5. FF-FXF (40 hp.)

6. PG-3 (30 hp.)

7. LE-LXE (24 hp.)

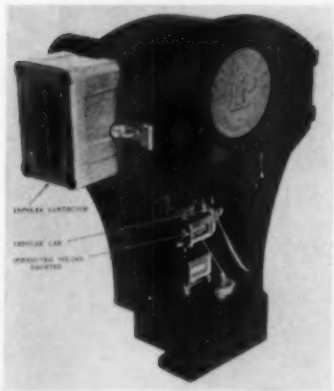
ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Ave., Toronto 16, Ontario
Gardner-Denver Export Division, 233 Broadway, New York, N. Y.
Oil Field Offices: Dallas, Houston, Tulsa, St. Louis, Los Angeles, New York, Pittsburgh, Denver, New Orleans, Durango, San Francisco, Kansas City, Winnipeg, Edmonton.

SHOWCASE . . .

New Equipment



Remote gas-meter reading

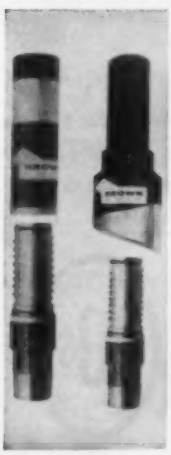
. . . achieved with a new electronic device. It enables you to receive all gas-meter readings in one central office.

Called an Impulse Contactor, the device is used with a Rockwell Emcorector, a gas-meter attachment that utilizes an integrating mechanism to provide a direct volume reading at a base contract pressure without correcting for line pressure.

When a specified volume of gas has been registered by the Emcorector, a gear is engaged. It moves a cam to complete an electrical circuit with the impulse contactor. With the circuit engaged, a pulse is transmitted to a counter on a central-control panel. **Write or call: Rockwell Mfg. Co., 400 North Lexington Avenue, Pittsburgh 8, for details on Impulse Contactor.**

•

Joint makes fishing safer



. . . by permitting right-hand release and reengagement for retrieving a fish. The lower pin end of the safety joint has a criss-cross right and left-hand thread to permit right-hand release.

The hazard of premature release while rotating with a strain on the fish is eliminated, the maker reports. If a fish cannot be retrieved, the retrieving head can be released by left-hand rotation. An antifriction ring keeps the retrieving head from getting too tight by right-hand rotation.

The Type CC safety joint is full-opening. The retrieving head is available on a rental basis, domestically and for export. **Write or call: Brown Oil Tools, Inc., P. O. Box 19263, Houston, for details on Type CC safety joint.**

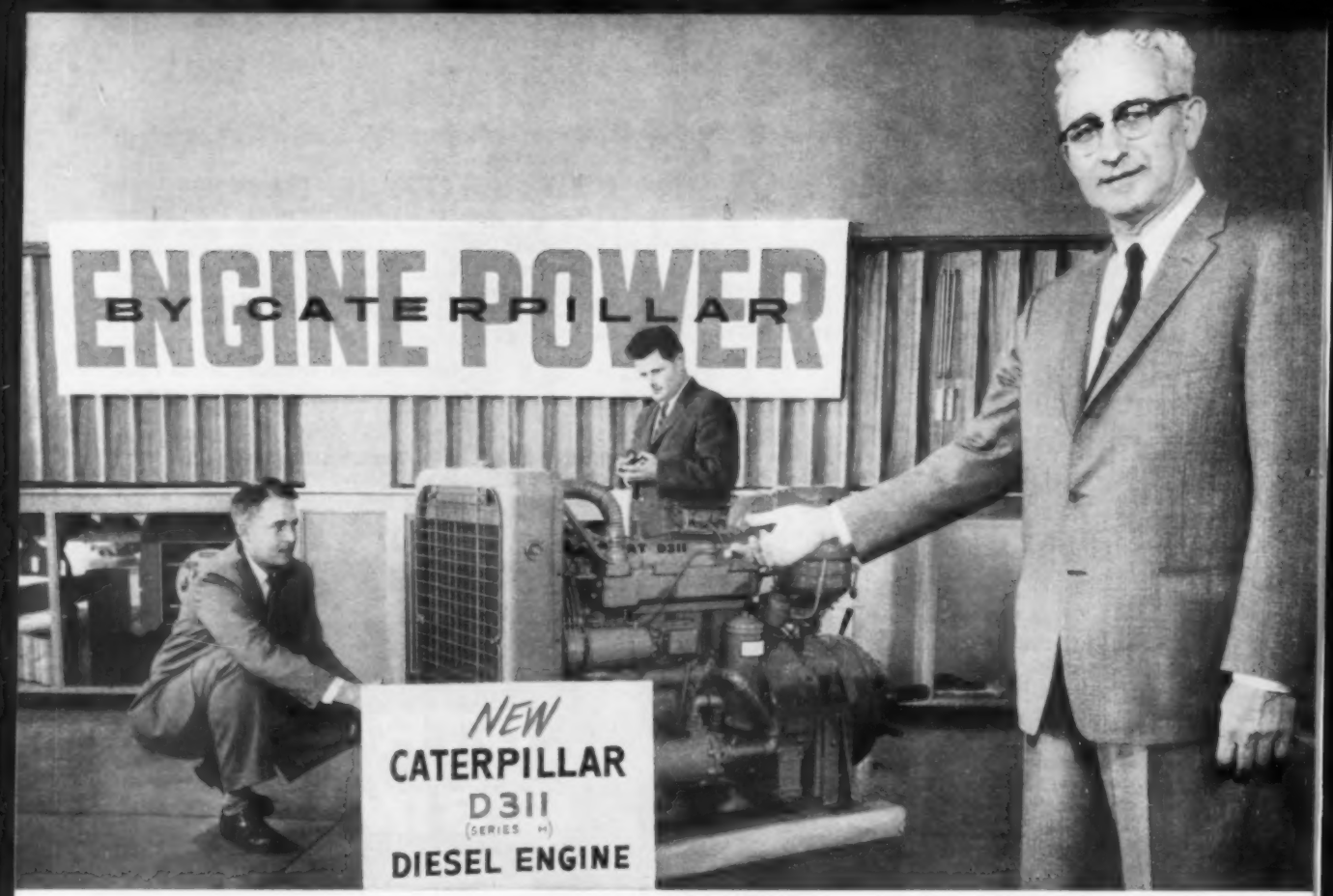
Heat-reflective paint

. . . now available for application to asphaltic surfaces. Called Plasticool NB, it may be applied directly, without primer, to asphaltic surfaces such as mopped tar roofs, rolled roofing, and asphaltic shingle.

The maker claims the plastic paint has excellent adhesion to clean asphaltic surfaces and does not allow bleed-through of solvents. The coating is brilliant white. It chalks slightly under weathering conditions, thus maintaining a self-cleaning white surface.

Colors are also available. They are nearly as heat reflective as the white color. The paint is said to be resistant to fungus growth and does not yellow under sunlight conditions. **Write or call: Coating Laboratories, Inc., 325 South Quincy, Tulsa, for details on plastic heat-reflective paint.**

THIS BLOWOUT PREVENTER IS
STRONG
SIMPLE
AND IT
REALLY
HOLDS PRESSURE!
DOUBLE-E
TYPE LP
BLOWOUT
PREVENTER
Prevents blowouts when pulling rods. Shuts in the well while replacing stuffing box rubbers. Flat faced rams seal against all diameters from 0 to 1½". No packing glands to leak. Available in all thread sizes. Get the Double-E Blowout Preventer through your local supply store!
EQUIPMENT ENGINEERS, Inc.
2039 Amelia St., Dallas 35, Texas • LAkeside 6-3873



Here's a field-trained Caterpillar Engine Specialist to tell you why the all-new Cat D311 Diesel Engine is a *natural* for oilfield operations.

"HERE IT IS...THE NEW 75 HP* D311 (Series H) FOR OILFIELD USE!"

"Let's start right off with the *biggest* news about this new engine as far as you oilmen are concerned: BIGGER POWER IN A SMALLER PACKAGE! That's right, the all-new D311 (Series H) is smaller, lighter, but *more* powerful than its predecessor. And that's why it's *right* for you—a modern, heavy-duty engine that's easy to install, quick to put to work, easy to move and especially designed by Caterpillar to outlast and outwork any comparable unit in the oilfield.

"Now here are some of the jobs this mighty-mite D311 will do for you. It'll provide prime power for mud mixing pumps and water pumps; it's great for powering utility boats; it'll furnish continuous auxiliary power for lighting and other electrical facilities; and it'll drill for you, too, depending upon your power requirements. Whatever you put it to, this power-packed D311 will do a real job. And remember, the new D311 (Series H), like all Cat Engines, offers an exclusive trouble-free fuel system which enables the engine to hit peak performance even with low-cost fuels for economy of operation.

"There's more to the story of what the all-new Cat D311 (Series H) can do for your operation. For further information, including model pictures of the engine itself, use the coupon on opposite page. By the way, next time you visit your Cat Dealership, ask for the Cat Engine Specialist. Our field experience with *all* kinds of power application may prove profitable to you. We'll be glad to help—why not give us a call?"

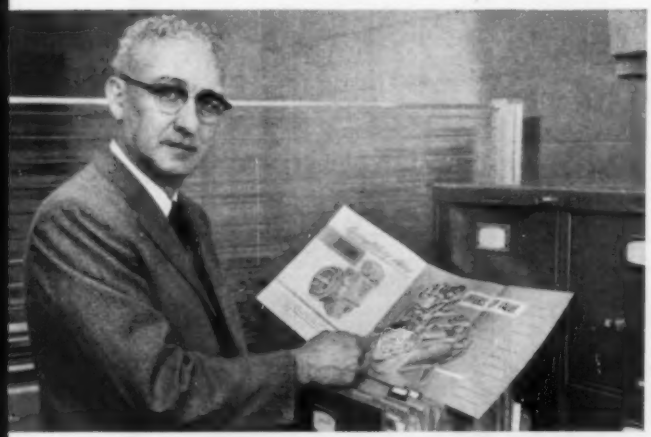
CATERPILLAR DEALER dES ENGINE SPECIALIST

Engine Division, Caterpillar Tractor Co., Peoria, Ill., U. S. A.

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.
*Maximum output capacity

"Here's a demonstration of that *bigger power in a smaller package* feature I was telling you about. Though it's a full 9" shorter and 350 lb. lighter than its predecessor, the new D311 (Series H) packs *more* power . . . 75 HP (maximum output capacity). And I know that portable power like this is a *natural* for you oilmen."

"Now here's the dope on that utility boat power application I mentioned. This is a Caterpillar Propeller Calculator, and I'm selecting the correct propeller size for various types of boats. Our estimates tell us that the compact, latest-design D311 packs the necessary power to drive the 'big' wheel in utility boat application."



"This is a cutaway view of the latest-design Cat Generator. Like the new D311, this new 30 KW generator takes up less space, yet gives out *more* power. Matched to the heavy-duty equipment used in the oilfields, it offers the best features of self-regulated and externally regulated generators."

"Our Dealer Engineer and I are checking the specifications of the new D311. We're designing this modern, heavy-duty engine into equipment manufacturers' machines either as original power or for repowering. Cat engines are available in over 150 leading equipment manufacturers' machines."

D311 (Series H) Specifications

Horsepower	75 HP® @2400 RPM
Cylinders	4
Bore and Stroke	4" x 5"
Length (fan to flywheel)	36¼"
Width	27⅞"
Height	38¼"
Weight (net dry)	1180 lb.

Dept. OG6, Engine Division
CATERPILLAR TRACTOR CO., Peoria, Illinois, U. S. A.

Send me more information about the completely new Cat D311 (Series H) Diesel Engine, Electric Set and Marine Engine.

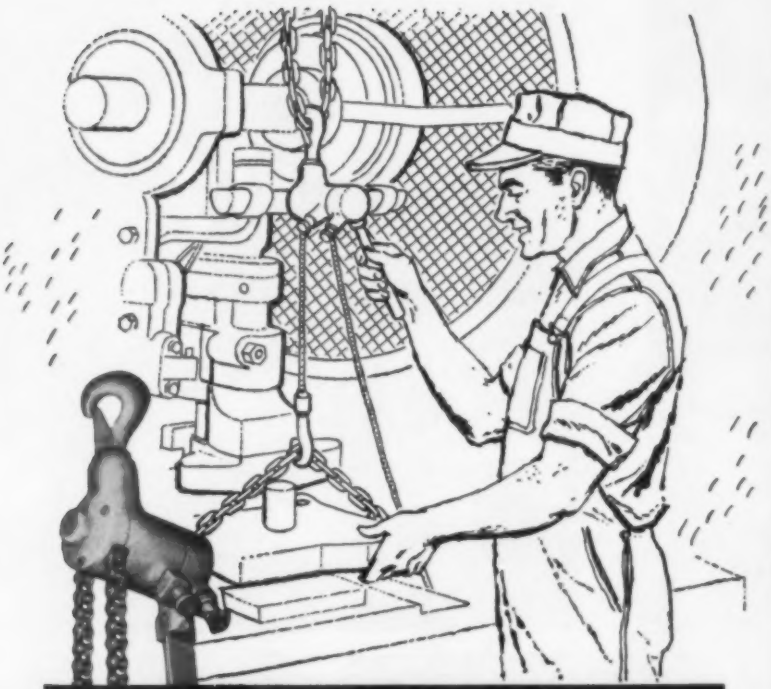
- ☐ Have Caterpillar Engine Specialist call for an appointment as I may be in the market for this new engine or other Cat Engines up to 650 HP®.
- ☐ Send me more information, including model pictures, on this new engine.

Name _____

Company _____

Address _____

City _____ Zone ____ State _____



STRONG, COMPACT AND LIGHTWEIGHT

The Coffing Mighty Midget Puller

Compact and lightweight, the Coffing Mighty Midget Pullers are handy lifting tools for all types of industries. The 1000 lb. capacity model weighs but 9½ lbs. and requires only 40 lbs. of handle pull. The 500 lb. model weighs 6½ lbs. and requires only a 28 lb. pull for full rated capacity.

The handle can be operated as a crank for fast lifting, or it can be used as a lever for short pulls, or for working in cramped quarters. Should the puller be overloaded, the "safety valve" handle will give before any load bearing part fails.

For full information on this compact, light and inexpensive lifting tool, consult your favorite supply store, or write for Bulletin MP.

COFFING HOIST

DIVISION OF

DUFF-NORTON COMPANY

818 Walter Street • Danville, Illinois

COFFING HOISTS
Ratchet Lever
Spur Gear, Electric

DUFF-NORTON

DUFF-NORTON JACKS
Ratchet, Screw,
Hydraulic, Worm Gear

FOR HIGH EFFICIENCY OPERATION

MARTIN-DECKER SPEED SELECTOR

Time To Be Using The Low Drum Clutch

If, at start of hoisting, the needle comes to position as shown, the draw works should be in high transmission speed and using the low drum clutch.

Time To Be Using The Hold Down Clutch

When sufficient pipe has been pulled (reducing the total weight) to bring the needle to point shown, it is time to shift to low transmission speed and use the high drum clutch.

Time To Be In High Gear

At this point it is time to change to second transmission gear and later as the pointer falls off shift to high gear.

The Martin-Decker Drawworks Speed Selector is used in the Type "D", "E" and "F" Weight Indicators. It automatically interprets the tension in the dead line and indicates directly the proper drum clutch and transmission clutch for the fastest and most efficent drawworks operation.

The Speed Selector *prevents:*

A. Speed ratios which are too high for the load with consequent overloading of chains, clutches and engines.

B. Speed ratios which are lower than the load requirements with subsequent loss of time.

The Speed Selector *provides:*

A. The most efficent use of rig equipment.

WRITE FOR DESCRIPTIVE LITERATURE

MARTIN-DECKER CORP.
HOME OF THE WEIGHT INDICATOR
LONG BEACH, CALIFORNIA

Tool cuts flange holes

. . . in tanks without use of punches, chisels, or hammers. One man can operate the tool, the maker reports. The tool is called an Enardo Unitank flange-hole cutter, 6066-K.

Feed is semiautomatic. End-mill cutters are used as the cutting tool. Hole diameters of 3¼ to 12 in. can be cut. No rollers or backup plates are needed. The tool is complete with all accessories as a kit. No other tools are needed.

When the end-mill cutter is hand-operated and cutting oil used, the cutter will not generate sparks, the maker says. On tanks containing no explosive gases, the cutter can be driven with an electric or air motor. List price of the tool is $595 complete with accessories. **Write or call: Enardo Mfg. Co., Box 1647, Tulsa, for details on hole cutter.**

●

Christmas tree in one piece

. . . does away with flanged connections between valves, tees, and flow manifolds. The tree is expected to overcome the problems of leakage, damage, and corrosion that affect connections on conventional high-pressure trees. Its light weight and small size makes "unitree" simple and easy to install. Even the large sizes won't need a platform for valve operation. A forged-steel piece serves as the body for all master, crown, and wing valves. The resulting tree stands about one-third as high and weighs about one-half as much as a conventional tree.

The valve core and valve can be easily serviced in the field by one man, the maker says. The tree comes in single or double-wing models for 2⅜ and 2⅞ in. API tubing. **Write or call: Oil Center Tool Co., 1912 Airline Drive, Houston 9, for details on "unitree."**

●

Pulse code telemetering

. . . system for positive-displacement meters is now available to display meter readings at receivers in digital form to six places. The two other spaces of an eight-section, horizontal, read-out window identify the meter being contacted.

Selection of the meter is by telephone dial. A reading cycle is completed in 7 seconds.

Transmitters come in explosion-proof enclosures. Electrical assemblies can be easily removed for shop servicing. Transmitter input may either be electrical (pulse or contact) or mechanical (direct drive). Distance from the transmitters to the receiver is unlimited. They may be scattered over a wide area.

Pulse rate is 5 per second. The maker says it is well within the rating of all parts and eliminates the need for a high-grade communication channel. **Write or call: Vapor Recovery Systems Co., 2820 North Alameda Street, Compton, Calif., for details on pulse code telemetering system.**

RELY ON RYERSON

Carbon steel—bars, structurals, plates, sheets, tubing, etc.
Stainless—pipe, tubing, sheets, plates, bars, etc.
Alloys—pretested, heat-identified alloys . . . case-hardening, direct-hardening, and heat-treated, including Rycut® free-machining leaded alloys.
Industrial plastics—PVC pipe, valves, fittings, sheets, rods, made-to-order parts; rigid Kralastic and flexible polyethylene pipe.

Services—fast, accurate processing—sawing, shearing, slitting and flame-cutting . . . any shape, any size, any quantity.

Whether you need a single item or a truckload, you can rely on Ryerson for prompt, personal attention . . . expert technical assistance . . . deliveries in record time.

RYERSON STEEL®
Member of the INLAND Steel Family

Other products include: safety plate • grating • expanded metal • chain • wire rope • reinforcing bars • pipe and tubing metalworking machinery

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA CHARLOTTE • CINCINNATI • CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • INDIANAPOLIS • CHICAGO MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

DOWELL'S 41 ACID ADDITIVES

DOWELL ENGINEERS USE THESE ADDITION AGENTS TO TAILOR ACID TREATMENTS TO THE REQUIREMENTS OF YOUR WELL

Each of the bottles shown here contains a chemical especially selected by Dowell to overcome certain formation peculiarities encountered in acidizing oil and gas wells.

Mere stores of chemicals mean little, however. They must be blended and used skillfully. Dowell engineers and chemists apply unparalleled experience in recommending these addition agents to speed up payout and increase ultimate recovery from your wells.

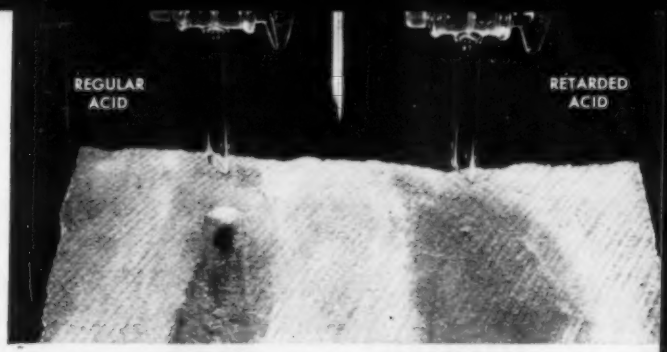
Dowell scientists are not satisfied with a single agent for a purpose. Since well conditions vary, they have developed *families* of agents to do each job.

When faced with a problem well, Dowell chemical and petroleum engineers, aided by the most modern laboratory equipment, analyze the problem. If necessary, they employ an electronic IBM system to help identify well samples and select the right addition agents. This complex system, developed by The Dow Chemical Company, is continually added to and modified—to provide you fast, effective analytical service.

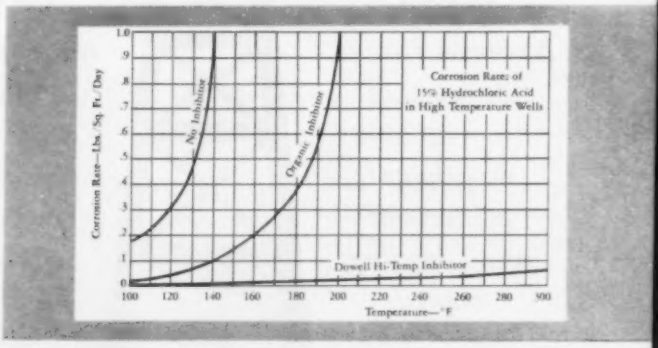
On these pages, you will find four examples of Dowell addition agents and how they work. For full information on "tailored" acidizing, call any of the 165 Dowell service points. In Canada, contact Dowell of Canada, Ltd.; in Venezuela, contact United Oilwell Service. Dowell, Tulsa 1, Oklahoma.

Services for the oil industry — DOWELL

A SERVICE DIVISION OF THE DOW CHEMICAL COMPANY



THE PETTIT FORMATION in East Texas and North Louisiana is an oolitic limestone, and a good example of a formation that responds favorably to Dowell Retarded Acid. This photograph shows the slower reaction rate of Retarded Acid (right) as compared to that of regular inhibited acid. The retarded action often results in higher production and faster payout.



THE USE OF an effective acid inhibitor is as important as the selection of the proper addition agent. For that reason Dowell research has developed a variety of inhibitors. Most famous of these is Dowell's high temperature inhibitor — proved effective in wells with bottom-hole temperatures up to 350° F.

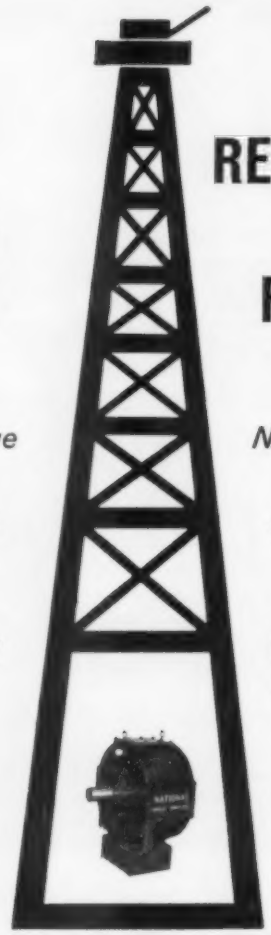
GIVE YOU A FASTER PAYOUT

SILICATES WITHIN the Strawn sand as found in Nolan County, North Texas, swell seriously when treated with regular inhibited hydrochloric acid. This frequently restricts production. When Dowell silicate control additive is blended with the acid, silicate swelling is reduced, as shown here. Good production increases are the rule in this area when Dowell tailors the acid treatment to control silicate swelling.

MUD ACID OFFERS different benefits to different producers. Along the Gulf Coast, operators order it for its excellent mud-removing qualities. In the Permian Basin, the Rockies, and Canada, it is valuable to spearhead fracturing, acidizing, or cementing operations. It is also useful to acidize certain sand formations of low regular acid solubility. In *all* areas it helps improve the results of Dowell stimulation treatments.

BUYING A NEW RIG?

National Torque Converters are available as original equipment on 10 leading makes of rigs



REPOWERING YOUR PRESENT RIGS?

National Torque Converters are available "packaged" or matched with virtually all makes of oil field engines

In any drilling operation today, it's a must to get the most results with the least investment. That's why it is important to equip with National Torque Converters. They can help a rig to make more hole faster, with less strain on operator and equipment, more useful work between overhauls, and with dependability that has run up to three quarter million feet of hole with no shutdowns.

You can get all these advantages in a new rig . . . because the National Torque Converter is available as original equipment on ten of the best-known makes.

You can get these advantages in repowering old rigs . . . for National Torque Converters can be ordered "packaged" with the engines of eight of the leading manufacturers . . . and matched to operate perfectly with the engines produced by virtually all other builders.

If you want to know about the service and advantage of the converters just ask a man who has used them. If you want to know about getting the advantages for your own rigs . . . just write:

THE NATIONAL SUPPLY COMPANY

INDUSTRIAL PRODUCTS DIVISION

Two Gateway Center, Pittsburgh 22, Pa.

Pace-setters in the progress of industrial power transmission

3 FAST RUGGED LOW COST

Pow-R-Ditchers

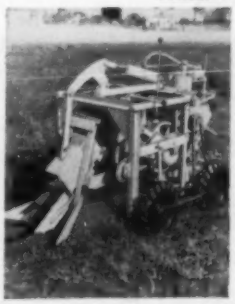
A Model For Nearly Every Need

Model 524T Pow-R-Ditcher

Lowest priced BIG ditcher on the market! Digs 8"-24" wide at speeds of 1'-15' per minute. One man operation. Ideal for contractors, municipalities, utilities, etc.

Model 4T Pow-R-Ditcher

The Vermeer "Midget Ditcher" digs 6"-14" wide and is only 6' high, 13' long, 48" wide. Easily transported on a pick-up truck. Very maneuverable and ideal for footings, cable, gas, water and sewage lines.



Model W-2 Pow-R-Ditcher

Smallest of the Pow-R-Ditchers, the W-2 digs 2½"-4" wide and 3' deep. For gas service, electrical service and shallow water lines.

Write For Literature and Low Prices on the Complete Vermeer Pow-R-Ditcher Line

Thousands of Pow-R-Ditchers used from coast to coast. Learn what low ditcher prices really mean! Write for name of nearest dealer.

VERMEER MANUFACTURING CO.

1447 W. WASHINGTON • PELLA, IOWA

SHOWCASE . . .

New Literature

Alnor dew pointer

. . . which uses the principle of varying pressure, rather than temperature, in determining dew points of any gas sample is described in new eight-page Bulletin 2051. In applications such as bottled gas, gas-transmission lines, and compressed-air lines, the instrument makes dew-point determination faster and easier, the maker says. **Write or call: Illinois Testing Laboratories, Inc., 420 North LaSalle Street, Chicago 10, for Bulletin 2051.**

Wellhead equipment catalog

. . . is a new 24-page bulletin (481) that presents a complete line. It includes pictures and sectional diagrams showing design features of parts and assemblies. Specifications for each part and the steps for making a "triple-sealed" wellhead are included. **Write or call: National Supply Co., 2 Gateway Center, Pittsburgh 22, for Bulletin 481.**

Sliding-gate sampling valve

. . . is presented in two-page Bulletin J-90. It describes a sampling valve designed for drawing off fluid samples for examination or laboratory test. Valve features described are self-cleaning seating construction, self-closure, and no packing. Valve bodies are available in bronze, cast iron, monel, or aluminum. They come in ¼ and ⅜-in. sizes with pressure ratings to 200 psi. **Write or call: Jordan Industrial Sales Div., OPW Corp., 6013 Wiehe Road, Cincinnati 13, for Bulletin J-90.**

Digital coder

. . . is described in new Catalog Sheet 32A100. It's a device which converts a shaft position representing the analog value of a variable into a coded digital output. The output can be fed into an electric typewriter, tape punch, computer, or printer. **Write or call: Fischer & Porter, 542 Jacksonville Road, Hatboro, Pa., for Catalog Sheet 32A100.**

Solid-film lubricants

. . . and their applications are described in new Catalog LB-6-1157. Eight different lubricants are detailed. They are formulated to solve lubrication problems which arise under conditions of (1) high temperature (to 1,500° F.), (2) low temperature (—300° F.), (3) corrosion resistance, (4) high loads (225,000 psi.), and (5)

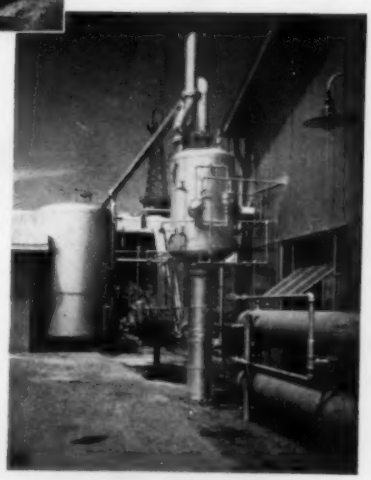
VAPOR PHASE® LENGTHENS ENGINE OVERHAUL LIFE

From 8,500 Hrs. to 25,000 Hrs. For Tidewater Oil Company

At the Hartman Lease Gas Compressor Station of the Tidewater Oil Co., Ventura, Calif., seven engine-compressor units are in operation: 1-150 bhp unit and 6-300 bhp units. The Vapor Phase installation includes a patented single Steam Separator, condensate unit, crude oil heater and steam turbine driven fan condensers.

Before Vapor Phasing, complete engine overhauls were required after 8,500 hours. Now the overhaul period has been extended to over 25,000 hours! Ring sticking is practically nil and carbon deposits are negligible.

The 5850 lbs. steam/hr. produced by the engines is now used to heat crude oil to help separate water and sludge from oil, and to heat workmen's change room. A Vapor Phase crude oil heater has replaced gas-fired oil treaters. The cooling tower used to cool engines has also been completely eliminated.



Thermal Circulation in all engines is accomplished by one large Vapor Phase unit, thus eliminating water pumps.

WRITE for full story on Vapor Phase economy —for *your* installation.

"Sole Developers and Manufacturers of Vapor Phase® Thermal Circulation (Ebullition) Engine Cooling Systems."

E C VAPOR PHASE

ENGINEERING CONTROLS Inc.

An Affiliate of St. Louis Shipbuilding & Steel Co.

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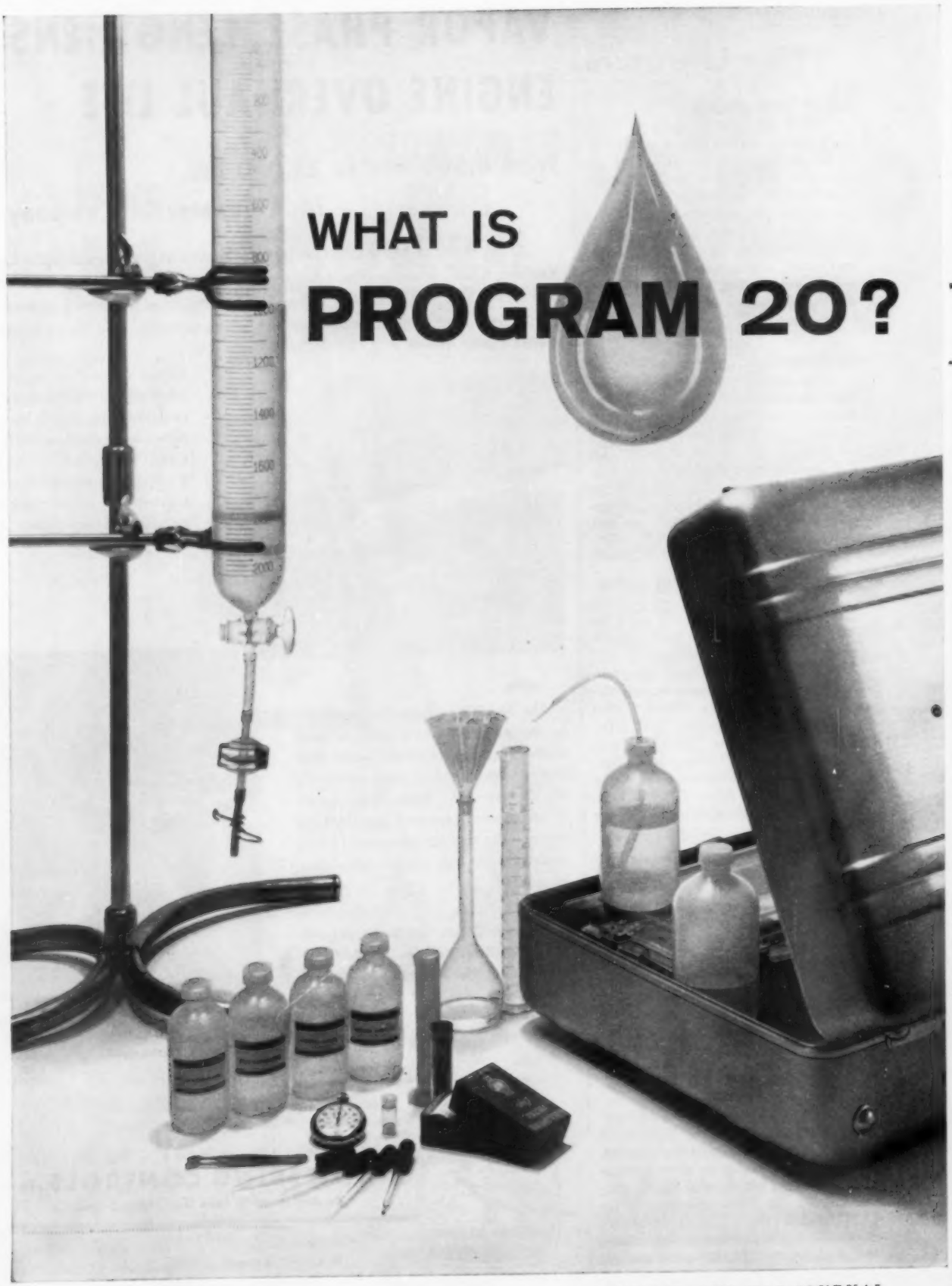
1939 N. Hillhurst Ave. Los Angeles 27, Calif.


WHAT IS
PROGRAM 20?

This elaborate "flow rate" kit, including unique membrane filter discs, will be used by the Pfizer Program 20 representative in testing your injection water.

IMPORTANT NEW FIELD TEST OF INJECTION WATER QUALITY

In this unique program, 20 college students of the Southwest will also demonstrate the iron sequestering ability of citric acid... give dramatic proof to secondary recovery operators!

● If you are responsible for water flooding operations in Texas, New Mexico, Louisiana, Oklahoma, Arkansas or Mississippi, a man from *Program 20* is coming your way. He is a chemistry or chemical engineering major from one of the leading colleges. He's working for Pfizer this summer – and getting valuable experience!

Pfizer hired him to test the quality of your injection water, to determine the iron content, and to demonstrate the outstanding utility of citric acid in preventing "iron plugging".

He will also give you information on the use of citric and gluconic acids with detergents in well clean out procedures, and information on the use of these same acids in HCl acidizing.

He will leave with you a complete test report and a Fact File that includes comprehensive technical information and research data for secondary oil recovery. **The test and data are FREE.**

This is an unusual opportunity for you!

Welcome the man from Pfizer Program 20!

Pfizer

PROGRAM 20

CHAS. PFIZER & CO., INC.
Program 20 Headquarters
7600 Ambassador Row, Dallas 35, Texas

Please have a *Program 20* man contact me:

Name_____

Title_____

Company_____

Address_____

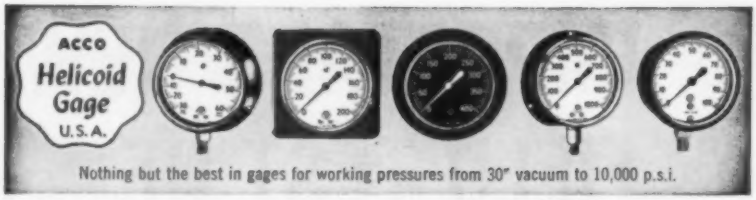
_____ ☐

Telephone_____

Flood Site Location_____

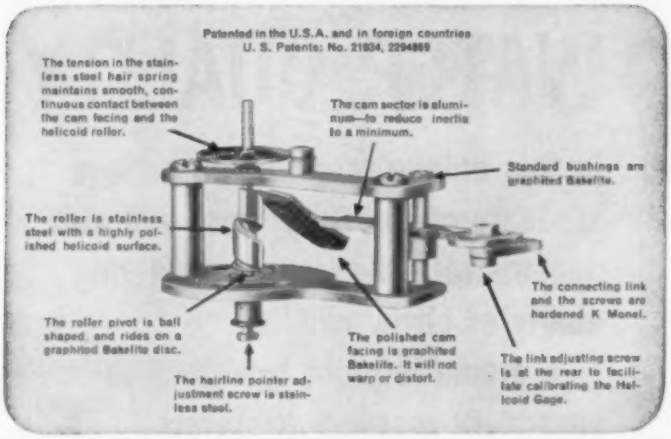
_____ ☐

Check the location where you would like to be contacted.



Nothing but the best in gages for working pressures from 30" vacuum to 10,000 p.s.i.

These details of Helicoid gage design assure longer life and enduring accuracy


Patented in the U.S.A. and in foreign countries
U. S. Patents: No. 21934, 2294869
The tension in the stainless steel hair spring maintains smooth, continuous contact between the cam facing and the helicoid roller.
The cam sector is aluminum—to reduce inertia to a minimum.
Standard bushings are graphited Bakelite.
The roller is stainless steel with a highly polished helicoid surface.
The connecting link and the screws are hardened K Monel.
The roller pivot is ball shaped, and rides on a graphited Bakelite disc.
The polished cam facing is graphited Bakelite. It will not warp or distort.
The link adjusting screw is at the rear to facilitate calibrating the Helicoid Gage.
The hairline pointer adjustment screw is stainless steel.

The superiority of Helicoid Gages is most evident in severe service—wherever a gage is subjected to violent pressure pulsations or severe mechanical vibrations.

The *sustained accuracy* of Helicoid Gages over *millions of cycles* is explained by the details of design and construction of the Helicoid movement shown above. Such Helicoid features—protect against wear and corrosion and assure sensitivity, sustained accuracy and trouble-free operation.

Easiest adjustment and calibration

Only Helicoid Gages have the external pointer adjustment pictured here. The Helicoid type adjustment cannot be jarred out of position.

Calibration of Helicoid Gages is accomplished easily, without removing dial or pointer, because the link adjusting screw is at the rear of the system.

Tubes built for millions of pressure pulsations

To fit the wide range of applications, Helicoid Bourdon tubes are available in four materials —alloy steel, K Monel, stainless steel and phosphor bronze.

All Helicoid tubes are made from seamless tubing and are carefully designed to give maximum torque and minimum stress. When used within the dial range, they will withstand many millions of pressure pulsations and will not stretch, leak or crack.

***For complete information on the Helicoid line of gages write for* Catalog G-52**

Helicoid gives you all these features at prices that are competitive in the quality gage field.

Helicoid Gage Division
AMERICAN CHAIN & CABLE

929-A Connecticut Ave. • Bridgeport 2, Connecticut

ACCO
A·C·G
TRADE MARK

When oil men talk about OFFSHORE DRILLING the name you hear repeated more and more is . . .

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OFFSHORE DRILLING CO.

• 1101 Philtower Bldg., Tulsa, Oklahoma
• 610 Saratoga Bldg., New Orleans, Louisiana

high speeds (to 30,000 r.p.m.). They can be applied to all metals, as well as plastics, rubber, glass, cork, and wood. **Write or call: Electrofilm, Inc., P. O. Box 106, North Hollywood, Calif., for Catalog LB-6-1157.**

Tenite polyethylene resins

. . . used in a variety of plastic products are described in a new 36-page booklet. The six basic uses for polyethylene—molding, pipe, film, coatings, blowing, and wire and cable covering—are reviewed. Features that make polyethylene suited for each use are outlined. A detailed table of specifications is included. **Write or call: Eastman Chemical Products, Inc., Kingsport, Tenn., for Tenite Polyethylene bulletin.**

Hortonclad composite metal

. . . produced by a flux-free, high-strength bonding process is described in a new 32-page brochure. This process provides an integral and continuous bond between an alloy or special metal and its backing plate. Available cladding and backing metals, fabrication, erection facilities, field stress relieving, and X-raying are discussed. **Write or call: Chicago Bridge & Iron Co., 332 South Michigan Avenue, Chicago 4, for Hortonclad bulletin.**

High-volume producer pump

. . . is discussed in new four-page Technical Bulletin EC-5803. It covers operational details, specifications, and cataloged parts information. **Write or call: Fluid Packed Pump Co., Box 64, Los Nietos, Calif., for Oilmaster Technical Bulletin EC-5803.**

Digital computer

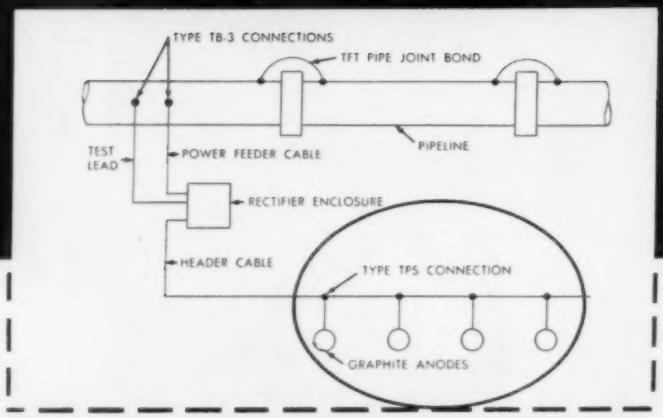
. . . the Bendix G-15, is described in a new bulletin. Featured is a full description of the simplified programing of the machine. Engineers can be taught coding techniques within 2 to 4 hours, the maker says. Specifications, accessory equipment, and applications are also described in the bulletin. **Write or call: Bendix Computer Div., 5630 Arbor Vitae Street, Los Angeles 45, for Digital Computer bulletin.**

Steam-trap maintenance

. . . is discussed in an illustrated two-page article. It describes a way to detect faulty steam traps. The method is based on the use of temperature-indicating crayons. They're used to discover whether or not the temperature of the return line below the trap is lower than the temperature of the steam-supply line above the trap. **Write or call: Tempill Corp., 132**

CADWELD®

reduces cost on header cable connections



Typical rectifier powered cathodic protection system

CADWELD TYPE TPS-WELDER makes both cable splices and tap connections in one unit. Easy reinsulation, since run and tap cables are parallel. Reinsulated as a splice, rather than a TEE connection. Use cable stub in tap cable opening when splicing.

Write today for your New Catalog

CADWELD®

Erico Products, Inc.

2070 E. 61st Place Cleveland 3, Ohio

IN CANADA: ERICO INCORPORATED, 3571 Dundas St., West, Toronto 9, Ontario

R. S. (Mister Cap) Barnwell of Barnwell Offshore, Inc., called on an independent Pittsburgh Steel Co. distributor for completely integrated service when this new offshore drilling barge was built—shown here on location. That's how the independent distributor made a big contribution when . . .

Johnny Morgan, drilling engineer for an independent Pittsburgh Steel Co. distributor, left, confers with R. S. Barnwell Jr., president of Barnwell Offshore, Inc., on plans for the Mister Cap offshore drilling barge.

Mister Cap Sailed On Time

Mister Cap not only sailed on time but also set a record by requiring only 12 days from christening to bringing in an oil well.

And that included the time it took to move the rig some 40 miles out in the Gulf of Mexico in the Mississippi Delta area.

Back of that record was a story of an independent distributor's service and the quality of the Pittsburgh Steel Co. oil country goods he supplied.

Here is that story:

When Barnwell Offshore, Incorporated, of Shreveport, La., built the new $4 million "Mister Cap" drilling barge, Barnwell asked this independent distributor to supply everything above and below the barge deck connected with drilling operations.

That included not only drill pipe, casing and tubing but also the mast and draw works, the pumps, the Diesel-electric equipment, pressure vessels, the valves and fittings and even the pipe usually supplied by shipbuilders who fabricate barges.

• **Adequate facilities**—The independent distributor was able to do a "lock, stock and barrel" job because of the wide range of services and facilities he offers customers.

Equipped with a Fabricating Division, Machine Shop, Welding Shop, Threading Department, Compressor Department and a Service and Parts Department, this independent distributor is hard to beat for a completely integrated service.

Although not every independent distributor has this line-up of facilities, it is typical of the service independents offer oil country customers.

V. J. (Vic) Martzell, vice president of the independent which did the big job for Mister Cap, says:

"We stay in business because we can make quicker decisions and because we're willing to get more sand in our shoes.

"Around here it's routine to keep close track of our customers' drilling operations and to make sure drillers get pipe and equipment they need when they want it without loss of rig time."

When you're paying around $1,000 a day for operating a land rig and as much as $8,000 a day to operate an offshore rig, you appreciate a supplier who can get you the pipe and equipment you need within hours.

All the independent distributors handling Pittsburgh Steel products in the

oil country operate that way. That's the key to their success . . . service.

This service continues long after the order has been filled. On the Mister Cap, for example, representatives from the closest of the distributor's twelve stores can be in constant contact with the superintendent in order that his every need may be fulfilled in a minimum amount of time.

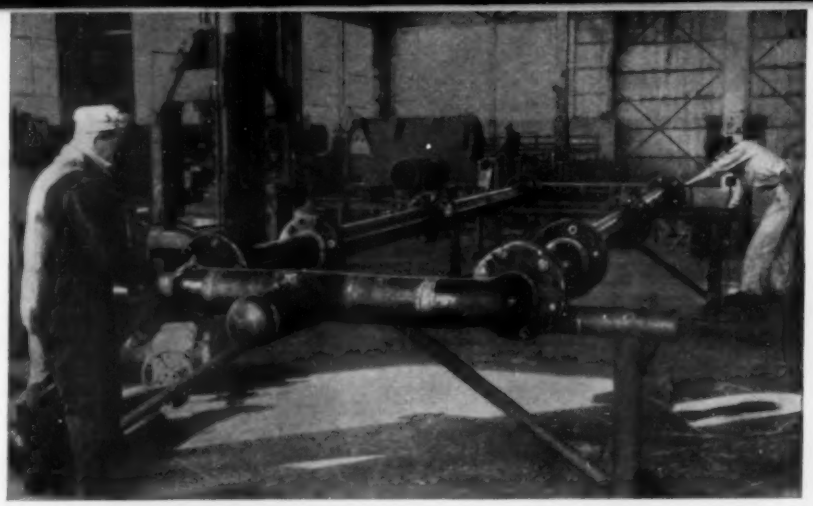
• **140 stores in field**—Wherever you are operating, you'll find the store of a Pittsburgh Steel independent distributor handy. There are more than 140 such stores scattered through the oil fields to supply top quality Pittsburgh Steel drill pipe, tubing and casing.

Independent distributors are ready for action—sales action. Their well-stocked stores make the best and latest equipment available 24 hours a day, seven days a week. Independents' service is flexible, free of unnecessary paper work and red tape delays.

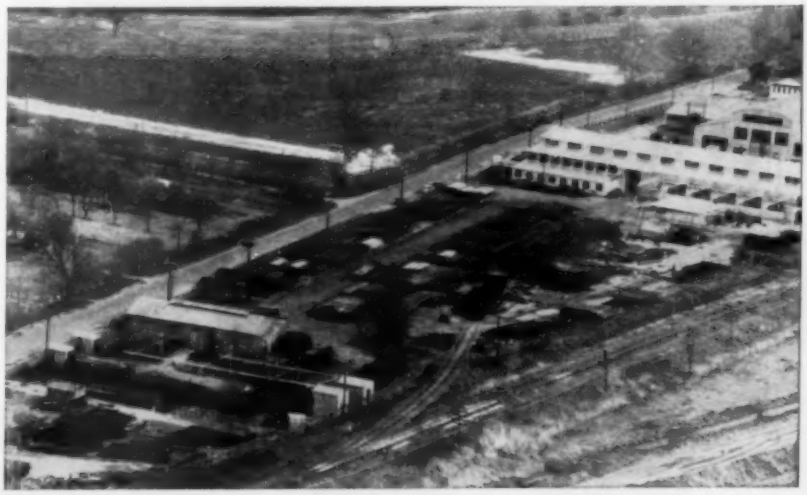
Independents are fully competitive because their costs are low. A local businessman—familiar with local business people and local business problems—the independent distributor is in his community to stay. He knows his success is related directly to selling quality products and providing unmatched service. That's why the independent distributor selects Pittsburgh Steel's Seamless Oil Country goods. And it's why you can rely on all the independents listed here.

When you need a string of drill pipe, casing or tubing, call one of these independent distributors.

You'll do better with the pipe of your choice bought from the distributor of your choice.

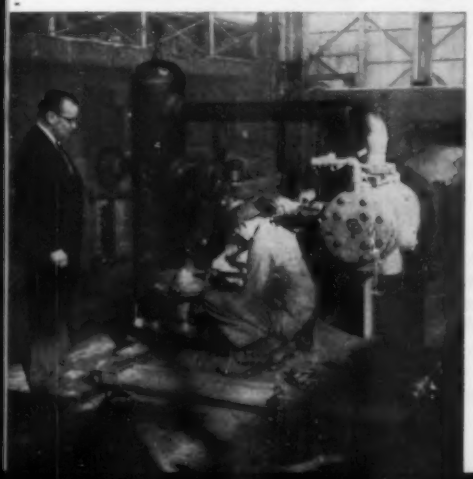


A gas measuring station for a natural gas line is prepared for hydrostatic testing in the distributor's large, well equipped Fabricating Division.



Adequate field stocks of Pittsburgh Steel Company tubing enable this Louisiana distributor to serve his customers adequately and quickly.

Thomas C. Poindexter, vice president and manager of the distributor's Fabricating Division, checks on compressor unit built for a pipe line company.



Distributor Home Offices

Bradford Supply Company
Bradford, Pennsylvania

Buckeye Supply Company
Zanesville, Ohio

Cardwell Manufacturing Co.
Wichita, Kansas

C. W. Cotton Supply Company
Tulsa 5, Oklahoma

Franklin Supply Company
Chicago 5, Illinois

Houston Oil Field Material Co.
Houston, Texas

Industrial Supply Company
Wichita Falls, Texas

Iverson Supply Company
Tulsa, Oklahoma

Longhorn Supply Co., Inc.
Houston 14, Texas

Lucey Export Corporation
New York 7, New York

Lucey Products Corporation
Tulsa 19, Oklahoma

McJunkin Corporation
Charleston 22, West Virginia

Midland Supply Company
Wichita 7, Kansas

Mountain Iron & Supply Co.
Wichita 2, Kansas

Murray Brooks, Incorporated
Lake Charles, Louisiana

The Producers Supply & Tool Co.
Fort Worth 2, Texas

Production & Refining Equipment Company
Odessa, Texas

Sandy Supply Company
Wooster, Ohio

Southwest Supply Company
Pittsburgh, Pennsylvania

Superior Iron Works & Supply Co.
Shreveport, Louisiana

Western Supply Company
Tulsa 1, Oklahoma

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

District Sales Offices

Atlanta, Chicago, Cleveland, Dallas, Dayton, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Tulsa, Warren, Ohio

built to finish FIRST

In the race to beat cost on construction and maintenance, Leland continues to lead the trucking industry in dependability, performance, durability and safety.

Leland's **"Packaged Unit"** — a ruggedly constructed assembly of field tested equipment which has proved ideal for winching, hauling, towing, or gin pole work.

Leland's **Single and Tandem Axle Self-Loading Floats** — designed for a single man to load and move the heaviest of loads with maximum safety. **The Leland Pole Trailer** — engineered for either single or tandem axle use — strongly built and simple in design, delivers maximum pay loads at minimum initial and maintenance cost.

Fast parts service on construction equipment wins another first place for Leland — on Thew-Lorain — Gardner Denver — C-M-C — Blaw Knox — Cedarapids — Cleveland Trenchers — Tulsa Winches and other nationally known lines. Immediately available to you anywhere in the country. Call for Leland Service TODAY.

Leland
EQUIPMENT COMPANY
Oklahoma City • TULSA • Longview, Texas

West Twenty-second Street, New York 11, for trap maintenance bulletin.

Impulse steam traps

. . . Bulletin T-1742 (57) gives detailed information on a line of impulse steam traps. Typical installations are shown for all series. Dimensions, capacity, weight, and prices are included. Included too are data on traps for normal condensate loads at pressures to 400 and 600 psi. and temperatures to 450° and 650° F. Also discussed are traps that handle lower condensate discharge capacities and traps for extra-heavy condensate loads up to 750° F. **Write or call: Yarnell-Waring Co., Chestnut Hill, Philadelphia 18, for Bulletin T-1742 (57).**

New molded cups

. . . for pump pistons, hydraulic service, and pneumatic equipment are reviewed in new Bulletin AD-145. Construction, recommended service and available sizes of synthetic-rubber, leather, reinforced synthetic-rubber, metal-bonded, and metal-reinforced cups are detailed. **Write or call: Garlock Packing Co., 423 Main Street, Palmyra, N. Y., for Bulletin AD-145.**

Pipe-connections catalog

. . . covers pipe connections, unions, vessel closures, and bleeder valves. Methods of construction, specifications, prices, and applications are featured in the 12-page booklet. The pipe connections are applicable for pressures up to 15,000 psi. **Write or call: Gray Tool Co., P. O. Box 2291, Houston, for Graybar catalog.**

Glassed-steel reactors

. . . and their installation, operation, and maintenance are detailed in new Bulletin 955. Proper gasketing for use in various corrosive environments, jacket-cleaning techniques, repair procedures for severe and mild chemical service and thermal shock are also included in the 12-page bulletin. Glass inspection, protection, and storage are detailed. **Write or call: Pfaudler Co., 1063 West Avenue, Rochester, N. Y., for Bulletin 955.**

Production of acetylene

. . . from natural gas by the BASF process through partial oxidation of natural-gas feed stocks is detailed in new Bulletin 257. Four pages discuss advantages of the process. Flow diagrams and schematic drawings are included to illustrate it. **Write or call: Chemical Construction Corp., 1733 Commerce Building, Houston 2, for Bulletin 257.**

The most dependable
PIPELINE PROTECTION
for only 1/2 of 1%
of the original Pipeline Cost

L·O·F Glass Fibers'
BLUE FLAG®
reinforcing pipe wrap

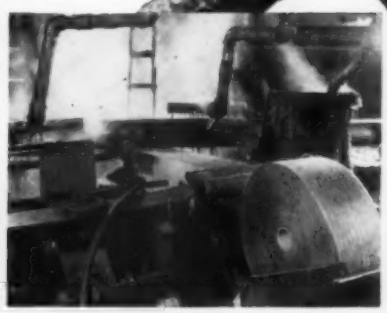
The low-cost preservation of huge pipeline investments has been conclusively demonstrated by the performance of L·O·F Glass Fibers' Blue Flag in thousands of miles of pipeline construction.

Subjected to punishing tests in extremely corrosive environments, Blue Flag has proved time and time again that it adds years of service beyond normal pipeline life.

Made of special inert glass, which resists the corrosive action of soil, Blue Flag is a strong uniformly porous mat that increases enamel strength, reduces "holidays" . . . provides high resistance to cracking and backfill damage.

EVERY DAY MORE AND MORE CORROSION ENGINEERS AND PIPELINE EXECUTIVES ARE SPECIFYING "BLUE FLAG" UNDERGROUND PIPE WRAP.

High tensile strength of Blue Flag virtually eliminates breakage during field wrapping operations.



Specify Blue Flag on mill wrapped pipe for added resistance to corrosion.

You get extra protection from backfill damage with Duramat® glass fiber reinforced outer wrap.

L·O·F GLASS FIBERS

For full details on complete pipeline protection, write to:
L·O·F Glass Fibers Company, Dept. 8-68, 1810 Madison Avenue, Toledo 1, Ohio

L·O·F GLASS FIBERS COMPANY
TOLEDO 1, OHIO

4900 FT.
5524 FT.
7444 FT.

THESE THREE REED BITS CUT 17,568 FEET OF HOLE

Average bit cost per foot: Under 20 cents!

The three Reed Y-Cobra bits shown at left drilled a total of 17,568 feet in Clearfield and Indiana counties, Pennsylvania in the Homecamp and Rossiter fields.

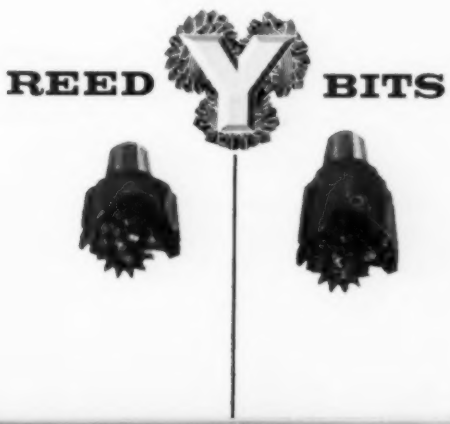
Bit Number one drilled 4,900 feet at 115 psi air pressure in 149 hours and 25 minutes (two runs in two wells).

Bit Number two drilled 5,524 feet at 85 psi air pressure in 149 hours and 36 minutes on one continuous run.

Bit Number three drilled 7,144 feet at 115 psi air pressure in 160 hours and 45 minutes in three wells.

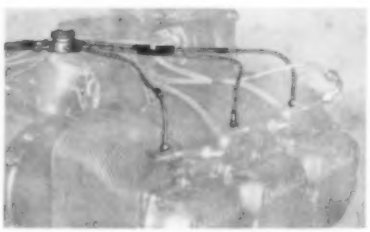
For unequalled performance by unequalled bits—
Specify Reed Y-Cobras!

REED ROLLER BIT COMPANY • Houston 1, Texas



Get there FAST in a '58 Beechcraft Bonanza

. . . FIRST with fuel injection



'58 BONANZA'S NEW ENGINE WITH FUEL INJECTION

GO FARTHER—FASTER

The four-place *Beechcraft* Bonanza
RANGE — up to 1,060 miles nonstop
SPEED — up to 210 miles per hour

Tomorrow's power — fuel injection — is yours today in the New Beechcraft Bonanza for '58! For the first time in commercial aviation, the magic of fuel injection gives smoother performance and 200 miles per hour cruising speed with the Bonanza's new 250 horsepower engine.

Now you can go faster, get there earlier, get more done than ever before. And you'll enjoy the supreme quiet and comfort of the Bonanza cabin as you watch the miles hurry by.

The '58 Beechcraft Bonanza is at least 30 miles per hour faster than any other single-engine commercial airplane. This rugged and right airplane uses less fuel than your family car, and no airplane is easier to fly!

Beechcraft

BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

For information about the **Bonanza** and the finest leasing and financing plans in aviation, see your Beechcraft distributor or dealer, or write Beech Aircraft Corporation, Wichita 1, Kansas, U. S. A.

Cooper-Bessemer Corp. assigns William Brafford

. . . as field engineer to its Chicago district office, according to Grant C. Woodard, general sales manager.

In his new capacity, Brafford will work under the direction of Richard J. Wheelock, district manager, contacting users of power and compressor equipment in the greater Chicago area. He has been with Cooper-Bessemer in its engineering department since graduation from college.

Charles O. Zagst and Walter J. Buehring named

. . . as vice president of sales and as vice president in charge of service parts, respectively, reports Louis M. Pearce, Jr., president of Waukesha Sales & Service, Inc.

C. O. ZAGST

W. J. BUEHRING

Zagst has been with Waukesha since 1949. He has served the firm as city salesman, Houston district manager, and assistant sales manager. He was sales manager until his present assignment. Before joining Waukesha he was with Shell Oil Co. and later Austin E. Stewart Drilling Co., Shreveport, La.

Buehring has been with Waukesha for 12 years. He has served as district manager of the New Iberia, La., service center and at Corpus Christi, Tex. He was formerly assistant purchasing agent with Southern Minerals Corp.

J. A. Hallett appointed

. . . as sales engineer by Condit Co.

Before joining Condit, he served with Westinghouse Electric Supply in Tulsa; Kerr-McGee Oil Industries in Tulsa and Oklahoma City; and YMAC Division of General Motors in Dallas, Tex.

The National Supply Co. moves into new store

. . . in Princeton, Ind., which replaces a store occupied there since 1921. The facilities include a sales room, warehouse, pump shop, and office.

William Y. Watson is store manager. The store is under the supervision of Robert T. Harris, district manager of the Illinois district.

Oil Well Supply Division announces changes

James M. Reid has been named district representative at Duncan, Okla., according to Mark Barkhurst, Mid-Continent area manager. James S. Necessary, field representative at Houma, La., has been transferred to New Iberia, La., reports M. F. Jones, Gulf Coast area manager.

Reid was employed by Oilwell in 1946 at Oklahoma City and was transferred to Cushing, Okla., as field representative in 1948. In 1949 he was named store manager at Elk City, Okla., and in 1951 store manager at Healdton, Okla. He became district representative at Ardmore, Okla., in 1952, and transferred to Duncan in 1952 as store manager. He was assistant district manager there until his present appointment.

Necessary joined Oilwell in 1948 at Jennings, La., and was named field representative there later that same year. He was transferred to Lake Charles, La., in 1941 and to New Iberia in 1950. In 1953 he was appointed store manager at that location. In 1955 he became field representative at Lake Charles and in 1956 transferred to Houma.

Welex, Inc., holds 2-week course in Houston

. . . in interpretation and analysis of resistivity and radioactivity logging for 14 men of its sales department. The course was held in its research and development laboratory and was conducted by R. B. Smith.

Those who completed the course are: A. A. Taylor, division radioactivity logging engineer, Midland, Tex.; J. S. Webb, logging operator, Corpus Christi, Tex.; C. W. Cook, rigman, Pampa, Tex.; E. M. Elbert, assistant district manager, San Angelo, Tex.; and R. B. Smith.

Second row are F. W. Blankenship, sales engineer, Crane, Tex.; J. B. Cross, sales engineer, Wichita Falls, Tex.; L. A. Cobb, division radioactivity logging engineer, New Orleans, La.; A. E. Choate, logging trainee, Woodward, Okla.; B. R. Putman, division radioactivity logging engineer, Denver; Tom Hansen, assistant district manager, Odessa, Tex.; R. E. Sandlin, logging operator, Hays, Kans.; Wally Melnyk, district manager, Welex of Canada, Ltd., Edmonton, Alta.; George Harcourt, city salesman, Tulsa; and M. L. Tetrick, logging operator, Bakersfield, Calif.

McKee and Raymond enter into working association

. . . for the designing, engineering, and construction of new petroleum refineries and chemical plants for overseas customers. The joint announcement came from H. E. Widdell, president of Arthur G. McKee & Co., and George F. Ferris, president of Raymond International, Inc.

Under the working association, the two organizations will coordinate their know-how and services for future

(Continued on page 192)

B. W. Armstrong, Regina, Can. | A. J. Artzer, Kimball, Nebr. | R. V. Atkinson, London, Eng. | E. H. Austin, Houston, Tex. | L. L. Ballew, Oklahoma City, Okla. | D. F. Barton, Ardmore, Okla. | W. H. Batchman, Ellinwood, Kans. | A. L. Beavers, Houston, Tex. | J. F. Belk, Calgary, Can. | C. G. Bell, Andrews, Tex. | T. G. Berryhill, Duncan, Okla.

D. E. Blacksten, Bakersfield, Calif. | W. M. Blaxton, Shreveport, La. | L. G. Botts, Las Morochas, Venez. | R. B. Bowden, Pampa, Tex. | C. O. Bridges, Sundown, Tex. | W. W. Bryant, Pampa, Tex. | N. K. Burkett, Laurel, Miss. | M. S. Caraway, Wichita Falls, Tex. | R. D. Cassel, Los Angeles, Calif. | E. M. Christensen, Edmonton, Can. | F. D. Church, Andrews, Tex.

J. W. Clark, Cody, Wyo. | F. M. Clowdus, Wichita Falls, Tex. | L. C. Combs, Casper, Wyo. | J. F. Cook, Tulsa, Okla. | G. M. Cowie, Edmonton, Can. | B. R. Cox, Midland, Tex. | W. G. Crow, Odessa, Tex. | F. E. Crunk, Casper, Wyo. | H. V. Cunningham, Estevan, Can. | B. L. Davis, Seminole, Okla. | D. A. Davis, Houston, Tex.

J. Dennis, Winnsboro, Tex. | J. F. Epley, Casper, Wyo. | A. L. Fillerup, Billings, Mont. | L. E. Fullingim, Victoria, Tex. | J. O. Gabrielle, Morgan City, La. | W. M. Golden, Pratt, Kans. | H. C. Gray, Odessa, Tex. | J. N. Gray, Odessa, Tex.

J. T. Green, Casper, Wyo. | J. M. Guinn, Corpus Christi, Tex. | A. M. Hackler, Wichita Falls, Tex.

FOR COMPLETE SERVICE HARMONY

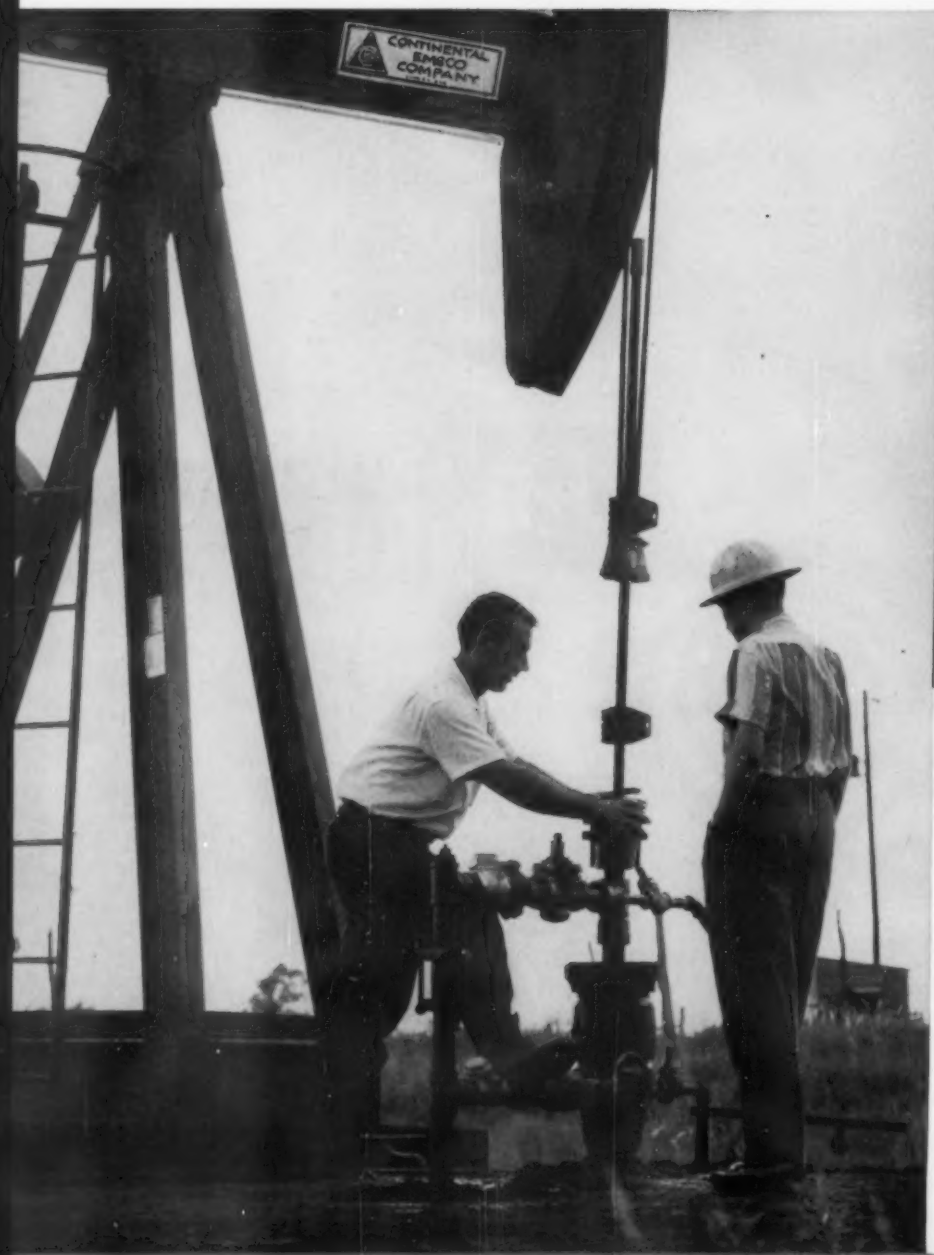
R. G. Hamilton, Sundown, Tex. | S. W. Hardcastle, Shreveport, La.

W. W. Havard, Anaco, Venez. | V. L. Hawkes, Edmonton, Can. | A. L. Hawkins, Graham, Tex. | J. E. Hawkins, Hadacol Corners, Tex.

J. S. Hawley, Jr., Odessa, Tex. | R. L. Hedgpeth, Odessa, Tex. | G. Hensley, Oklahoma City, Okla. | A. H. Johnson, Los Angeles, Calif. | B. R. Johnson, Hobbs, N. Mex. | H. L. Jones, Shreveport, La. | N. W. Krainosky, Edmonton, Can. | C. W. Lee, Abilene, Tex. | C. W. Ligon, Houston, Tex. | R. C. Loe, Shreveport, La. | E. W. Longmire, Dallas, Tex.

Go CONTINENTAL-EMSCO

L. L. Lossett, Jr., Harvey, La. | B. D. Love, Hobbs, N. Mex. | J. L. Lusk, Odessa, Tex. | T. A. Mann, Tulsa, Okla. | J. S. Martin, Tulsa, Okla. | H. L. Mauldin, Abilene, Tex. | J. I. McQuiddy, Casper, Wyo. | B. V. Mills, Morgan City, La. | R. L. Hicks, Snyder, Tex. | M. E. Moore, Kilgore, Tex. | H. E. Moudy, Ellinwood, Kans.



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Learn
you av
costly,
will in

Equipment

Lift Here for Lower Production Costs

J. Silhavy
Odessa, Tex.

J. Silhavy
New Iberia, La.

D. O. Smith
Morgan City, La.

H. C. Smith
Casper, Wyo.

V. C. Smith, Jr.
Corpus Christi, Tex.

R. L. Snider
Tyler, Tex.

W. W. Thomas
Odessa, Tex.

W. R. Thomp
Nocona, Tex.

C-E Service Backs Up Every Continental-Emsco Pumping Power Unit

A C-E serviceman is always available to help with engine and electric motor maintenance and repairs. He can also analyze your pumping requirements, power sources and changing well conditions. His analysis will show the correct C-E Pumping Engine or C-E Green Triangle Electric Motor size to give you maximum pumping efficiency at the lowest possible power cost.

On-Location Service

Keeps Your Unit Pumper Humming

Continental-Emsco field representatives are always eager to familiarize your operating personnel with the maintenance of C-E unit pumpers. They *know* these units. They can show your people how to obtain efficient operating speeds . . demonstrate counterbalancing . . and check on well and equipment performances. Learn to rely upon your C-E man . . he'll help you avoid trouble and in emergencies, prevent costly, prolonged shutdowns. His services will increase production profits.

. . Proper Maintenance Can Mean Longer V-Belt Life, Too

Correct V-belt tension extends the life of the belt and eliminates power-loss due to belt slippage. Your Continental-Emsco field representative will be glad to show you how to make these adjustments. Ask him, too, about GREEN TRIANGLE V-belts . . the belt designed, engineered and built exclusively for rugged oil field use by New York Belting and Packing Company, America's foremost producers of industrial rubber goods.

"V-Belt Guide for Pumping Units" will give many pointers on proper maintenance for V-belts. Write Continental-Emsco or get your personal copy from your Continental-Emsco representative.

t that Hums

W. R. Thompson, Rocona, Tex. · L. Thornton, Russell, Kans. · D. M. Thorwart, Newcastle, Wyo. · V. Underwood, Lindsay, Okla. · J. A. Upton, Williston, S. Dak. · F. J. Viktorin, Morgan City, La. · J. Weaks, Houston, Tex. · H. D. Weaver, Anaco, Venez. · R. L. Welchel, Lake Charles, La. · J. F. White, Magnolia, Ark. · C. C. Williams, Kilgore, Tex.

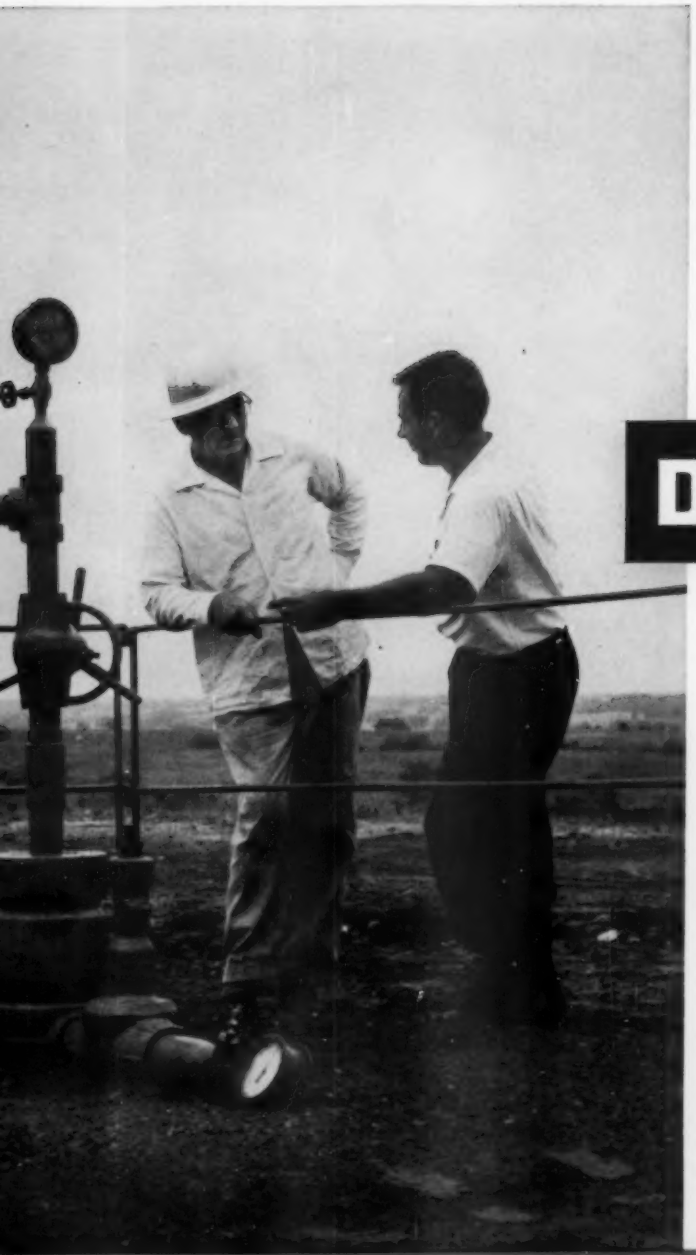
D+B

Specialists..Parts.. and Service Keep Your Wells Producing

Continental-Emsco D+B pump repairmen are located in C-E pump shops near your producing wells. They have a thorough knowledge of subsurface pumps, regardless of make or manufacturer. D+B specialists are company trained and seasoned by day-to-day contacts with the pump problems of their area. They are furnished the best in pump shop equipment . . much of it designed and built to C-E specifications. Let us repair your pump with D+B replacement parts . . *the best buy of the industry* with our field pick-up and delivery.

for Service

B. J. Merray, Harvey, La. | G. R. Nichols, Hobbs, N. Mex. | B. Oliver, Healdton, Okla. | P. W. Parker, Corpus Christi, Tex. | B. J. Peery, Falfurrias, Tex. | V. D. Pierce, Abilene, Tex. | F. C. Place, Oklahoma City, Okla. | J. D. Poole, El Dorado, Kans. | H. W. Pringle, Great Bend, Kans. | J. C. Pullen, Bakersfield, Calif. | C. A. Oden



Your Continental-Emsco Man Can Cut Production Costs with the Right

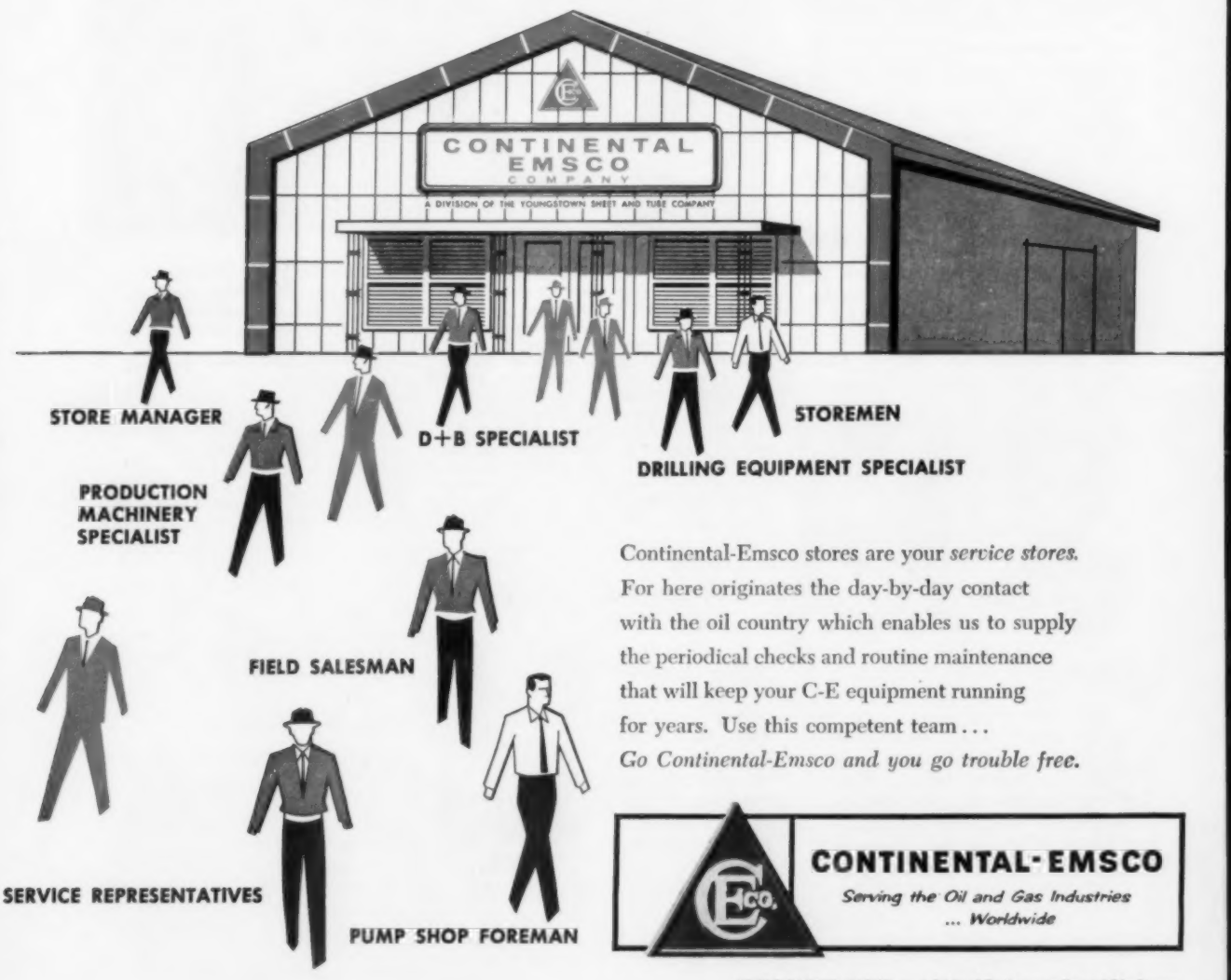
D+B SUCKER ROD

When planning to put a well on the pump, rely upon the experience of your Continental-Emsco man. Day-by-day contacts with the producing wells of the area give him invaluable experience on the proper size and grade of D+B sucker rods and other subsurface equipment to use in your wells. When you rely on Continental-Emsco, costly equipment failures are reduced to a minimum. Talk to your D+B man.. he has the answers for lower pumping costs.

e that Sings..

C. A. Reardon Odessa, Tex. | O. B. Reed Monahans, Tex. | F. H. Rinne Los Angeles, Calif. | J. G. Ritchey Houston, Tex. | L. W. Ryan Hobbs, N. Mex. | D. D. Sands Midland, Tex. | F. H. Schiffinger Shreveport, La. | W. E. Schmidt Las Morochas, Venez. | M. D. Seiley Morgan City, La. | W. L. Shields Salem, Ill. | E. C. Sloemate Drumright, Okla.

A Service Team to Keep Your Equipment Humming



Continental-Emsco stores are your *service stores.* For here originates the day-by-day contact with the oil country which enables us to supply the periodical checks and routine maintenance that will keep your C-E equipment running for years. Use this competent team . . . *Go Continental-Emsco and you go trouble free.*

CONTINENTAL-EMSCO

Serving the Oil and Gas Industries ... Worldwide

CONTINENTAL-EMSCO COMPANY • A Division of The Youngstown Sheet and Tube Company
General Offices: Dallas, Texas • Export Division: 45 Rockefeller Plaza, New York, N. Y.
Continental-Emsco Company Limited • General Offices: Calgary, Alberta, Canada
Continental-Emsco Company C.A., Caracas, Venezuela • Plants: Los Angeles • Houston • Garland, Texas • *Representatives in All Principal Oil Fields of the World*

..Go CONTINENTAL-EMSCO

J. H. Williams, Oklahoma City, Okla. | K. N. Willis, Odessa, Tex. | W. C. Wilson, Houston, Tex. | B. G. Winters, Natchez, Miss. | R. L. Wishart, Jr., Elmwood, Kans. | R. L. Wright, Borger, Tex. | W. L. Young, Wichita Falls, Tex. | Leroy Polk, McCamey, Tex.

P728R

petroleum refinery and chemical contracts in Europe, Asia, Africa, Australia, New Zealand, and South America. Each organization will have the right to do business individually in the specified territories, should it not be to the mutual advantage of the two companies to work together on any particular project.

McKee and Raymond have each completed contracts within their respective fields.

Kelite Corp. names Schirtzinger and Kole

. . . as district sales managers, according to William Sorensen, marketing director. Schirtzinger will be responsible for Kelite sales in Ohio. He will headquarter in Dayton, Ohio. Prior to his promotion, he served the

SCHIRTZINGER

H. W. KOLE

company as a sales engineer for the past 5 years.

Kole will be responsible for sales in the area formerly comprising the Miami and Atlanta districts and including Alabama, Florida, Georgia, North and South Carolina, and eastern Tennessee. He will headquarter in Charlotte, N. C. He was formerly employed by Fisher Memphis Air Craft and Oakite Products, Inc.

Murdock Tank forms custody transfer systems division

. . . according to company President F. L. Murdock. Murdock Tank & Manufacturing Co.'s new division manufactures complete automatic custody transfer systems for the automatic unattended sale of merchantable measured oil. These systems include both the calibrated positive meter tank and the positive displacement meter types.

A permanent display and demonstration unit of the 50-bbl. single shell meter and dump tank custody transfer system has been installed at the company's Tulsa plant. Maynard H. Jackson, manager of the division, states that both custody transfer systems for automatic sale of oil and complete wellhead to pipe line packaged systems are currently available.

Mission Manufacturing Co. holds meeting in Houston

. . . to outline sales plans for the balance of this year. Gulf Coast district personnel who attended the meeting are back row: Fred Jisha, Houston; Morton C. King, Houston; Gerald Seber, Houston; Harold Herren, New Iberia, La.; Neal Heaps, Houston; Jason P. Curtiss, Corpus Christi, Tex.; C. J. Magee, Cincinnati, Ohio; Calvin O. Bell, Houston; Tony Volotoko, Houston; and Ed Anders, Houston. Third row are: John Sandberg, Houston; Miller V. Sparks, Houston; Ken Woodward, Houston; Byrom Wehner, Houston; Melton Wright, Houston; W. C. Underwood, Houston; Shad Mims, Houston; Harold L. Riley, Metairie, La.; Francis J. Herbert, Lafayette, La.; Bob Rooth, Shreveport, La.; and W. N. Brown, Houston.

Second row are: Dudley C. Sharp, Jr., Houston; Jack Bannister, Old Ocean, Tex.; Anan Golub, Houston; Richard E. White, president, Houston; W. B. Sharp, chairman of the board, Houston; T. R. Fullinwider, Houston; J. S. Stewart, Houston; and A. E. Higginbotham, Metairie. First row are Bill Roberts, Houston; S. L. Heidemann, Houston; Ed Boyle, Houston; Sonny Wyatt, Houma, La.; and Joe Scalise, Houston.

Okanagan Helicopter Group adds four Bell 47 G 2's

. . . to a fleet working in Northwest Territories and in Yukon. The four new units, purchased from Bell Helicopter Corp., Fort Worth, at a cost in excess of $40,000 each, have been assigned to Okanagan Helicopters, Ltd., a member company of the group.

L. F. STEVENSON

With the addition of these new units, Okanagan Helicopters, Ltd., will be operating a total of 15 Bell helicopters and 1 Sikorsky S-55 in its territory. In addition to Okanagan Helicopters, Ltd., the Okanagan Helicopter Group includes as subsidiaries; United Helicopters, Ltd., St. John's, Newfoundland; Canadian Helicopters, Ltd., Toronto, Ont.; Smart Aviation, Ltd., also at Toronto; and Agar Helicopter Consultants, Ltd., Vancouver, B. C.

At a very recent annual meeting of Okanagan Helicopters, Ltd., and subsidiaries, held in Vancouver, Air Vice-Marshall Leigh F. Stevenson, C. B., was elected chairman of the board. Douglas Dewar, C.B.E., a founder and now retired board chairman, becomes honorary chairman. J. J. West, was named vice chairman to fill the vacancy created by the resignation of O. St. P. Aitkens, a founding director.

A total of 52 machines, 1 Sikorsky S-58, 21 Sikorsky S-55's, and 30 Bells are operated by the group across Canada. Most of the craft are contracted to the exploration department of oil companies.

Edward A. Bertram appointed general manager

. . . of Yuba Heat Transfer Division of Yuba Consolidated Industries, Inc. He will replace N. S. Livingston who has been transferred to Yuba's Adsco Division in Buffalo, N. Y.

Bertram became a vice president in 1957, after Yuba bought the Heat Exchanger Division of The Lummus Co. For 5 years prior to that time he had been manager of the European Heat Exchanger Division of Lummus.

Yuba Heat Transfer Division designs and manufactures condensers, feed water heaters, and evaporators for the power industry and heat exchangers for the chemical and petroleum industries.

Continental-Emsco Co. announces appointments

James G. Ritchey, former district D+B specialist will headquarter in the Dallas home office as D+B special representative.

Other assignments include: A. B. Williams to the position of D+B specialist at Nocona, Tex.; and D. F. Barton to D+B specialist at Healdton, Okla.

Forrest R. Tracy has been named sales engineer for its division office in

MUELLER®

line stopper fittings and equipment

- **ISOLATE SECTIONS OF LINE**
- **TIE-IN LINES AND LOOPS**
- **REPAIR LEAKS AND EQUIPMENT**
- **REPLACE AND INSTALL EQUIPMENT**

. . . without interrupting flow!

use this simple procedure:

Fasten stopper fittings to line.
Attach gate valves to fittings.
Cut out sections of pipe in fittings with drilling machine.
Attach stopping machines to gate valves.
Connect by-pass line.
Establish flow in by-pass line.
Lower stoppers and stop-off line.
Blow-down isolated line section.
Make repairs, tie-ins or installations.
Purge line and build up pressure in line.
Relax and raise stoppers.
Remove by-pass line.
Plug fittings.
Remove gate valves.
Cap fittings.

Turn the page for catalog information on line stopper fittings and equipment for 1½", 2", 3" and 4" lines.

NO-BLO®

MUELLER CO.
DECATUR, ILL.

Form No. H-8876

Printed in U.S.A.

stop-off lines from 1½" through 4"

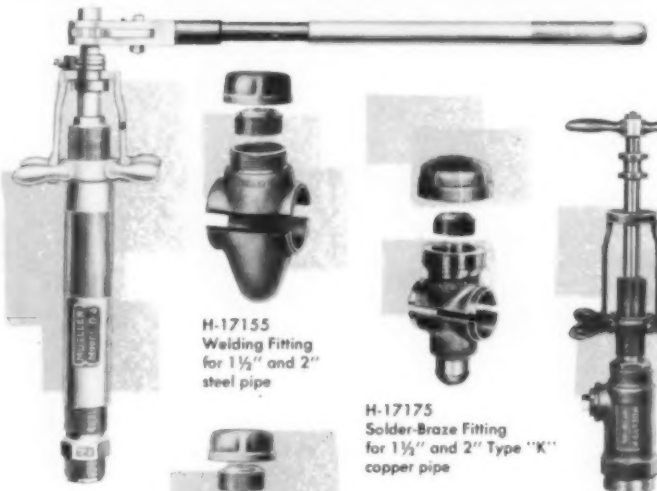
Mueller line stopper unit No. 1
. . . for stop-offs on 1½" and 2" lines.

Line Stopper Unit No. 1 is used to stop-off 1½" and 2" steel, cast iron or copper lines under pressures up to 125 p.s.i. and temperatures to 250° F.

The "D-4" or "DH-2" Drilling Machine is used to cut out the section of pipe in the fitting. The "D-4" is hand-operated; the "DH-2" is hand or power operated.

The H-17135 Stopping Machine is used to insert, expand and extract 1½" and 2" solid or by-pass rubber stoppers; insert and extract 2" deferred completion stoppers; and to insert and extract 1½" and 2" completion plugs.

Unit No. 1 consists of machines and attachments for stopping-off two fittings at one time to isolate a section of pipe.



D-4
Drilling Machine

H-17155
Welding Fitting
for 1½" and 2"
steel pipe

H-17175
Solder-Braze Fitting
for 1½" and 2" Type "K"
copper pipe

H-17135
Stopping Machine

H-17165
Mechanical Joint Fitting
for 2" steel pipe
for 1½", 2" and 2¼"
cast iron pipe

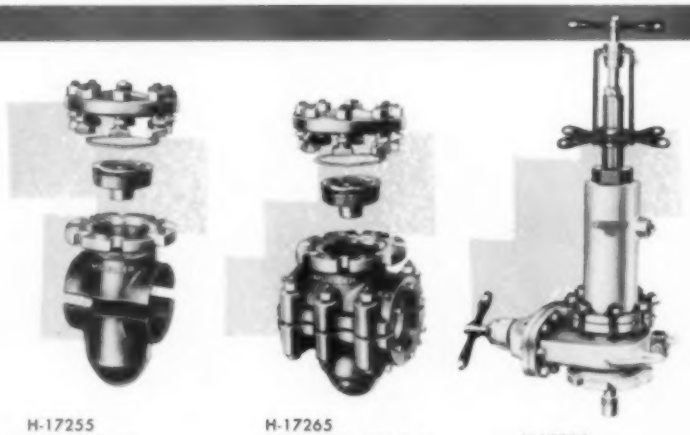
Mueller line stopper unit No. 2
. . . for stop-offs on 3" and 4" lines.

Stop-offs may be made on 3" and 4" steel or cast iron lines under pressures up to 100 p.s.i. and temperatures to 250° F. with the Mueller Line Stopper Unit No. 2.

The section of pipe in the fitting is cut out with the new, automatic Mueller CH-6 Drilling Machine. The CH-6 may be hand-operated with a ratchet handle or power-operated with the Mueller H-601 Air Motor or the Mueller H-602 Gasoline Engine Drive Unit. No changes in the machine are needed to use either hand or power operation.

The H-17235 Stopping Machine is used to insert, expand and extract 3" and 4" solid or by-pass rubber stoppers; and to insert and expand 3" and 4" deferred completion stoppers and completion plugs. The steel body has a 1¼" inside I. P. thread by-pass connection.

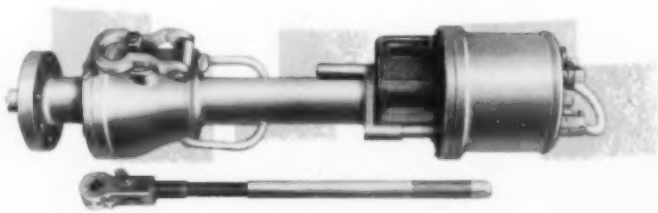
Two stopping machines are included with the Unit No. 2.



H-17255
Welding Fitting
for 3" and 4" steel pipe

H-17265
Mechanical Joint Fitting
for 3" and 4" steel
or cast iron pipe

H-17235
Stopping Machine



CH-6
Drilling Machine

Contact your Mueller Representative or write direct for full specifications on Mueller Line Stopper Units for stop-offs up to 12".

NO-BLO

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MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles.
In Canada: Mueller, Limited, Sarnia, Ontario

Tulsa, and William M. Blaxton will be division production equipment specialist at the Shreveport, La., division office.

Ralph N. Brodie Co. names Robert M. McFarland

. . . as northern California division manager. He has been in sales engineering for Brodie meters since 1947. He was instrumental in introducing a number of new applications of positive displacement metering in liquid blending, container filling, pipeline, and processing fields.

Driltrol Corp. appoints Robert G. Pearson

. . . sales representative to manage operations for Driltrol stabilizers in the Mid-Continent and Rocky Mountain areas. He will headquarter in Oklahoma City.

He was formerly with The Geolograph Co., serving for 8 years as the firm's sales and service manager in Oklahoma and the Four Corners area.

Cleaver-Brooks Co. assigns W. F. Zunker

W. F. ZUNKER

. . . as sales manager, industrial boiler division, according to J. C. Cleaver, president. Zunker will work with the company's sales outlets in the United States and Canada and will report to H. F. Holtz, general manager. Zunker has been with Cleaver-Brooks for 9 years. He has served as contract supervisor for the boiler division. For the past 3 years, he has been assistant to the sales manager and in charge of special assignments in the application of boilers.

J. C. Hammelef appointed industrial sales manager

. . . for Mercedes-Benz diesel engines, according to W. A. Martin, director of sales, Utica division of Curtiss-Wright Corp. In his new position he will direct Mercedes-Benz diesel sales for all industrial applications.

Hammelef joins Curtiss-Wright's Utica division after 25 years with Chrysler Corp.'s industrial engine division as director of the marine and industrial engine division, and as sales manager of the industrial engine division.

S. R. Bowen Co. opens new Houston office

AL SPARDIS

. . . in the Bank of the Southwest Building, reports Paul Bowen, president. Al Spardis, who has served the company in a number of capacities at Santa Fe Springs headquarters, has been appointed manager. Bowen is a manufacturer of fishing tool equipment. This office was established to better serve its customers in the Gulf Coast and Mid-Continent areas.

Ethyl Corp. names J. D. Bailie, W. W. Sabin

. . . as manager of sales technical services and as chief refinery technologist in the central region, respectively.

Bailie will locate in New York City. In his new capacity he will coordinate

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jet action tri-dia
diamond bits

Careful advance planning regarding D&S "jet action" Diamond Bits to be used is as important as planning the rest of your drilling program. Order your D&S bits to fit specific conditions, not as "on-the-shelf" items. Volume circulated, type mud, formation, and rock bit footage are information needed to determine D&S jet bit design to give you peak performance, dollars saved.

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OFFICES IN ALL PRINCIPAL OIL AREAS

DIAMOND DRILLING EQUIPMENT

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"The children and I will be gone all evening dear—beer and fried chicken in the kitchen—good TV starting at 6—oh, yes, your boss wants you to be sure to write up that drilling contract so he can present it in the morning."

technical activities for Ethyl's sales department. He has been with the company for 19 years. He was formerly chief refining technologist in Chicago. Prior to his new position, Sabin was supervisor in the refinery technology division at Detroit. He replaces Bailie.

N. W. Landis appointed

. . . manager of the Northeast region of Allis-Chalmers Industries Group, according to an announcement from Allis-Chalmers Manufacturing Co.

He has been manager of the Group's New York district since 1955. Prior to that time he has successively been manager of the Syracuse, N. Y., and Detroit, Mich., districts. He joined Allis-Chalmers in 1938.

Greer Hydraulics, Inc., establishes sales office

. . . in Dallas, Tex. Fred W. Gottschling was appointed manager of this new office and will concentrate on engineering-sales liaison with the petroleum production, chemical processing, and other industries.

Greer Hydraulics manufactures hydro-pneumatic accumulators, valves, and other hydraulic components.

Dresser Manufacturing Division announces changes

. . . in its personnel. Donald L. Garrison, southeastern sales representative for the gas market in Atlanta, Ga., has been transferred to Chicago as district manager, gas.

D. L. GARRISON

James L. Mattern, field consultant in the plastic products department in Bradford, Pa., has been transferred to Atlanta as southeastern district manager, gas. Richard T. Alt, North Central sales representative, gas, with headquarters in Milwaukee, Wis., has been appointed North Central district manager, gas, at Minneapolis, Minn.

J. L. MATTERN

R. T. ALT

Engineering Supply Co. appoints J. L. Dunlap

. . . as manager of the industrial sales department, according to G. W. Levering, Jr., president. He was industrial salesman for the past 4 years. He will be replaced by Robert V. Scott, formerly an inside telephone salesman with the company.

J. L. DUNLAP

Engineering Supply distributes industrial, electronic, geophysical, power transmission, and safety supplies through the Southwest. It is a subsidiary of Texas Instruments, Inc.

Industrial Controls Div. holds training course

. . . on its electronic process control system at its new plant in Danbury, Conn. Attending the session were 16 representatives of 9 companies from all sections of the United States, Canada, and Europe. Petroleum and chemical industries were represented as well as engineering companies.

The program, lasting 4 days, was planned by the training department.

NOW

100% Year 'Round Operation of Rising Stem GATE VALVES

Eliminate the costly hazard of rising stem gate valves that won't open or close — install . . .

DELTA VALVE STEM SHIELDS

PATENT PENDING

Positive protection against grit and grime, corrosion due to salt water, fumes, acids, and damage by the elements. Heavy, transparent plastic enables you to always see *position* and *condition* of valve stem. Sizes for any rising stem gate valve. Installed in a jiffy. Don't wait until calamity strikes — order your DELTA SHIELDS today! Give valve sizes.

For additional protection use

DESCO VALVE STEM LUBRICANT

This Type S-100 lubricant is a special compound for protecting and lubricating threads and stems of gate valves. Prevents rust, corrosion and icing up. Easily applied with brush. Packed in 1- and 5-lb. cans.

DELTA-DESCO

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The Only Complete Valve Lubrication Company

VALVE LUBRICANTS AND EQUIPMENT

Color Coded Lubricants • Hand Guns
Fittings • Air-Motor Volume Guns
Automatic Lubricators • Electronics

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DELTA ENGINEERING SALES CO.
Box 1403 Shreveport, Louisiana
Branch Offices in All Principal Cities

The men reeceived instruction in the operation, calibration, and maintenance of American-Microsen instruments.

Industrial Controls is a division of Manning, Maxwell & Moore, Inc.

J&L Steel Corp. promotes J. B. Gibson, W. F. Ewart

. . . to assistant manager, tubular products, and to administrative assistant, tubular products, respectively, according to John E. Timberlake, vice president, sales.

Gibson was formerly special representative, line pipe products. He joined J&L Supply Division as a storeman at Shreveport, La., in 1949. He was named sales office manager at the division's Chicago office in 1954.

Ewart formerly was a junior salesman in J&L's Baltimore, Md., sales office. He joined J&L as a sales trainee. Following completion of the training program in 1954, he was appointed a beginner salesman in the Baltimore district.

Security Engineering names C. B. McDonald

. . . as a regional special sales representative assigned to servicing specific drilling problems in the Gulf Coast regions of the United States, Central and South America. The announcement came from A. M. Birnie, executive vice president, sales.

C. B. McDONALD

McDonald's tenure of service to the oil industry throughout North and South America covers some 30 years. He has been employed by oil producing and petroleum equipment companies.

Security Engineering Division is one of the Dresser Industries.

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PETROLEUM ENGINEERS
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WICHITA FALLS, TEXAS

RESERVOIR ENGINEERING
Water Flooding Gas Repressuring
EVALUATION CORE ANALYSIS
SURVEYS ECONOMICS
Cost Estimates, Design, Installation
FIELD SUPERVISION
Phone 3-2167

Arthur G. McKee & Co. names J. H. Berger

J. H. BERGER

. . . sales engineer, according to M. J. Livingston, vice president of the engineering and construction firm.

Berger will specialize in chemical plants for McKee and will headquarter in the company's New York office. He was formerly manager of the sulfuric acid and phosphate department of Chemical Construction Corp.

Bell & Gossett Co. names S. R. Schleicher

. . . as general manager of its Marlow Pumps Division. Headquarters for the division are in Midland Park, N. J.

He joined Marlow in 1950 on a special engineering project and later became production manager. He retains the duties of this position and will now assume added responsibilities. Before joining Marlow he was with Watson Flagg Machine Co.

Beech Aircraft Corp. names Bruce B. Brewer & Co.

. . . as its advertising agency, according to Phil McKnight, manager of public relations and advertising for Beech. The appointment becomes effective July 1.

The company manufactures four Beechcraft commercial airplanes: the 4-place Bonzana and Travel Air; the 6-place Twin Bonanza; and the 8-place Beechcraft Super 18.

Stratoflex, Inc., names nine executive officers

. . . according to a recent announcement. The Stratoflex officers are: K. W. Davis, president and general manager; D. H. Thornbury, vice president; C. A. Thomas, vice president, sales; John Tullis, vice president, manufacturing; R. O. Moore, chief auditor; W. E. Strittmatter, secretary-treasurer; Byron Scarborough, assistant secretary; B. L. Coontz, assistant secretary; and W. B. Hague, assistant treasurer.

Stratoflex is a manufacturer and distributor of detachable, reusable fittings and hose assemblies.

LOW db with JZ QUIET BURNERS

Any acceptable db level can be reached with John Zink Burner Mutes. The John Zink line includes over 50 gas, oil and combination gas and oil burners for process application. Where noise is a problem, these burners are equipped with John Zink Burner Mutes, the most efficient means of lessening primary and secondary air noise.

The John Zink Company is famous for *workable* solutions to special burner problems. Outstanding research and testing facilities assure perfect on-the-job performance for all new designs.

JOHN ZINK
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TULSA, OKLAHOMA

THE PARKERSBURG RIG AND REEL CO.
PARKERSBURG WEST VIRGINIA
MADE IN U.S.A.

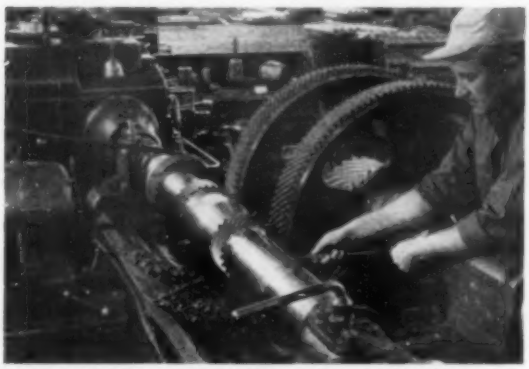
QUALITY and PERFORMANCE

are Engineered and Built into
PARKERSBURG Pumping Units

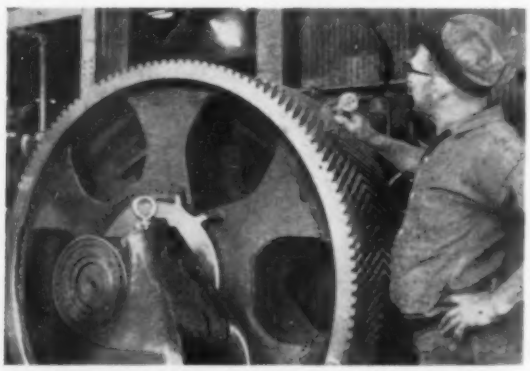
The dependability that makes Parkersburg Pumping Units top choice in the field begins on the drawing board and continues through all manufacturing steps. Here are typical shop scenes showing why you can depend on quality-built Parkersburg Pumping Units with herringbone gear reducers.

Quality Control from Design
to Completed Pumping Unit Makes a
PARKERSBURG
YOUR BEST BUY

Inspector checking ground shaft for accuracy. Parkersburg Pumping Units are made to exacting specifications.

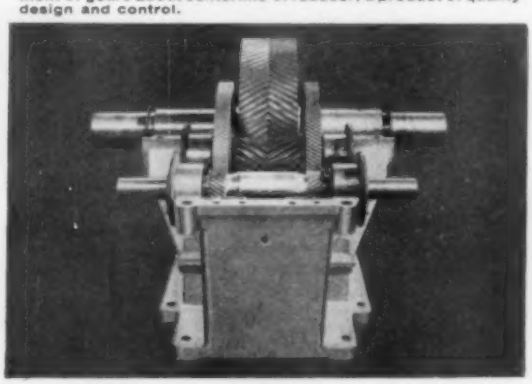


Constant inspections at all stages of construction insure dependability. Inspector here is checking centers on lapping machine.



Checking gear teeth with comparator gauge. This assures proper angle for strength and freedom from undercutting.

Interior of "split case" reducer showing symmetrical arrangement of gears about centerline of reducer, a product of quality design and control.



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PARKERSBURG
RIG & REEL COMPANY
Division of Parkersburg-Aetna Corp.
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Pumping Unit Division Offices:
710 Mid-Continent Building Tulsa, Oklahoma

Parkersburg Pumping Units are available through the following supply stores:

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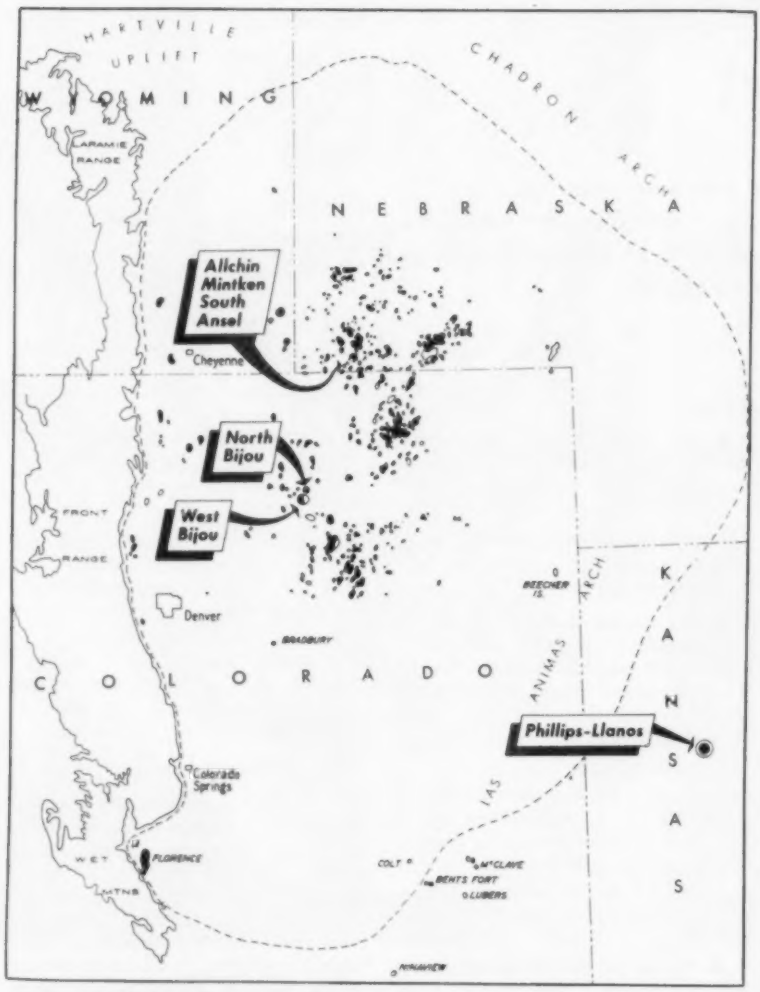


THESE IMPORTANT NEW FIELDS have given a much needed boost to drilling activity and success in the Denver basin. Many "package" drilling programs, involving 6 to 10 wells each, have been announced in recent weeks.

Flush new fields revive Denver basin

BY FRANK J. GARDNER

AS RECENTLY as 1957, Denver basin success had slowed to a point where many operators were tempted to write its obituary. Today, it's an entirely diferent story. And 1958 will probably be the best in its 10-year history.

The reasons . . . Why this sudden revival? There are many reasons, some tangible, some intangible. For one thing, leases are beginning to expire, and evaluation is a must. Farmouts are easier to come by. Some fine discovery wells have come in since January, with potentials near the 1,000-bbl. mark. Drilling costs are down. If you get a well, you can produce it with few restrictions. Pipelines and markets are right at hand. And last (and this one is hung on a big **maybe**), Denver basin oil finders have become more astute at smelling out strat traps.

Take a look at the 1958 record. Since January 1, drillers have found 26 new oil fields in the basin. This required 238 wildcats. The success ratio, 12.7% for Nebraska and 10.2% for Colorado, hovers at the national average. Geologists have estimated that 85% of all basin fields are strat traps. To maintain the national average in sucessful wildcatting in 85% strat-trap country would reflect that we're learning how to spot the pinch-outs.

Now look at the drilling density—one test to every 6 sq. miles. That's a basinwide figure, and not a true one, for up till now the drilling has been crowded into only the center part of the basin. The density out toward the flanks is much less than one to six.

For a better outlook . . . In its first 9 years, the Denver basin coughed up 376 new fields for an average of 42 per year. So far in 1958, it has yielded 26 new ones. Doesn't this point to 1958 as the best on record? Look for at least 50 new fields this year. Discovery means drilling, and if this 1958 record gains momentum (and it probably will), this large province will once again have a major influence on total Rocky Mountain drilling, already ahead of last year. The announcement of multiple-well programs by several operators in recent weeks reflects the trend. During the third week of May, 19 new locations hit the Denver basin scout reports.

Are based on recent hits . . . Here are a few examples of recent finds: in Kimball County, Nebraska, British-American Oil Producing Co. completed its 1 Allchin, Section 10-12n-56w, for 712 bbl. per day from Dakota-Cretaceous "J" sand at 6,537 ft. on April 30. Three offsets are now finished for 476, 979, and 768 bbl. Only 2¾ miles southwest of the Allchin, Braden Drilling Co. 1 Petsch, Section 20-12n-56w, has flowed 60 bbl. per hour on a "J" sand test and is now preparing to complete.

To the south, in Morgan County, Colorado, Williamson & Kissinger 1 Matthews, Section 12-4n-60w, opened the West Bijou field with 930 bbl. daily from the Dakota "D" sand, and several flush offsets have been finished. Just this month, Thames & Turnbull, also in Morgan County, completed their 1 State in Section 5-4n-96w, for 960 bbl. a day from "D" sand at 6,100 ft. and two offsets are now on the way down.

A geologist's day in court

A geologist may serve the legal profession in many capacities, both on the witness stand and in advisory services to counsel and to clients.

BY DANIEL S. TURNER
Consulting Geologist, Denver

RELIABLE geological opinion proffered the client in his quest for natural resources may forewarn him of both extravagant risk and legal entanglements. The geologist is, therefore, in a position to recognize the need for and recommend legal services to his client.

As counsel to businessmen, an attorney should likewise be in a position to recognize the financial risk encountered by his client and to recommend the natural-resources specialist who is best qualified to evaluate the potential of the resource. Many times in our experience, however, the adage of "locking the door after the horse is stolen" comes into play as the client, who has not profited by forewarned opinion, appeals to the court to extricate himself from costly entanglements. Opinion evidence may be brought to bear in the interpretation of technical problems of the occurrence of specific natural resources.

The Necessary Attributes

Since geology is a science composited of observation, experience, and theory, the testimony of a geologist as a technical witness in litigation may present the facts upon which a decision can be based. One obvious purpose of a technical witness is that of translation and interpretation of technical data to a common ground of understanding for the trier of facts, whether it be a jury, the court, or an administrative body.

Assuming that the geologist called as a witness can be qualified as an expert, and assuming further that he has sufficient knowledge of the particular facts and has a thorough understanding of these facts and principles as may be presented by the attorney's hypothetical question, then there are other attributes which he should possess:

- He should be an experienced public speaker, having developed thereby a "stage presence" or ability to "think on his feet."
- He should be experienced in teaching technical material in elementary phrases.
- He should have a convincing manner and a thorough comprehension of his subject, such as through effective presentation there is no doubt about his qualifications in the mind or minds of the trier of facts.
- Knowledge of his subject is not enough. The witness should have an insight into the ramifications of all phases of science which may pertain to the client's problem.
- He should be adept at demonstrating related features of other sciences to the court.
- He should be able to advise the attorney regarding the most significant technical features which may be emphasized.
- He should realize that both favorable and unfavorable facts should be brought to the attention of the legal counsel, so that proper defenses may be prepared.

The common sense rules that apply to medical testimony will also fit geological testimony, since both professions use the "scientific approach": that's the belief of Daniel S. Turner, consulting geologist and engineer of Denver. Turner was a geologist for the Atomic Energy Commission in 1948, and in 1950 joined Carter Oil Co. He became a consulting geologist in 1952.

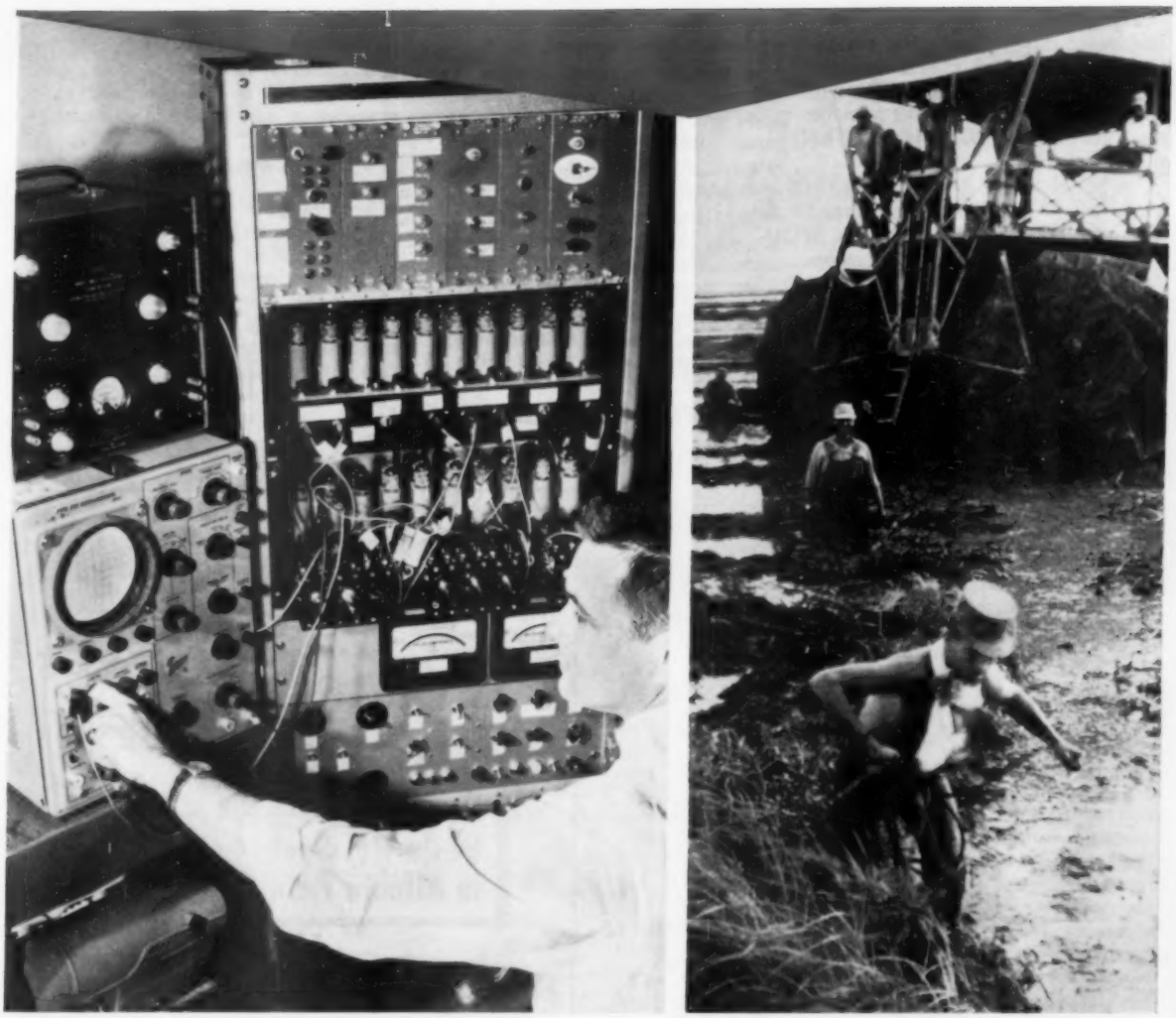
- He should be aware of the fact that volunteered information, beyond the direct answer to questioning, may be damaging to his attorney's case or his plan and procedure.
- Having provided the required technical data, he should rely on the attorney's opinion of the value of points and order of emphasis.

Fields of Application

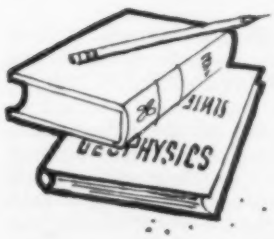
A geological consultant may be thought of as a "general practitioner" in the exploration and exploitation of natural resources very much as an attorney in general practice covers his field. The application of, and the need for, legal assistance is common knowledge to all. Applications of the work of geologists are not as well known, yet most of the commodities we use every day derive their material from natural resources. These items are available to use through the application of some phase of geological knowledge.

Physical . . . The geologist must be a student of nature, earth process, economics, mineral law, and industry, applying these studies to the economic use of earth materials for the benefit of man. Natural-resource products include mineral, oil, gas, water, building stone, clay, sand and gravel, fuels, abrasives, cosmetics, fertilizers, cleansers, and many other mundane items of everyday use. Modern technology demands that the raw materials be exploited through geologic analysis and an engineered plan.

Geologic evaluation is required in the selection of sites for location of engineering structures. Problems of underground water, the bearing



lab or field, these men revise the textbooks*



Do your potential reserves wait in "no record" areas? Are they obscurely trapped in areas of easy shooting? Do ghost reflections or singing records cause you to miss important discoveries? GSI's *problem-solving* staff welcomes such difficulties.

Yesterday's textbook solutions no longer provide all the right answers. Where classical techniques are inadequate, GSI revises the text.

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strength of foundation materials, mineral identification, description, evaluation, and location of oil-bearing structures, are just a few of the fields in which geological counsel and research may provide valuable facts and reduction of risk.

Financial . . . Exploitation of natural resources is popularly known as a "gambler's game," and is so recognized in our national tax structure. The financial hazards of the business, coupled with the fact that exploitation involves a nonrenewing "crop," dictates a need for financial encouragement to the natural resource investor. The tax advantage extended to investors and the ensuing depletion allowance, granted to income from a depletable resource, are in themselves mute testimony to the element of risk.

A risk factor is inherent in the very nature of the occurrence of earth materials. Apparent erratic localization of all minerals, oil, and water within the crust of the earth, coupled with the fluctuation of markets and costs of extraction, is involved in the problem of exploitation of natural resources.

It is the responsibility of the geologist to function as a technical moderator of the "risk" through application of technical knowledge to the expected continuity and volume of the specific ore body, the nature of the oil reservoir, or the properties of the artesian water system. No resource can be considered a profitable commodity until the cost of development, extraction, processing, and the market potential of the product have been weighed in a "trial balance."

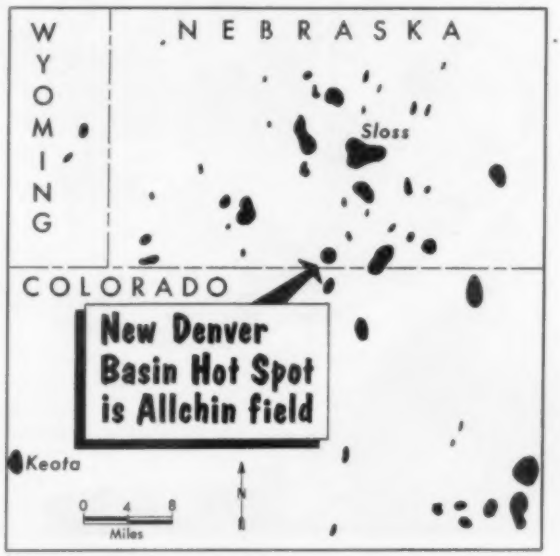
The geologist must be in a position to evaluate every factor in the balance sheet in order to best advise his client regarding the element of risk which he faces through investment in that commodity. Use of a geologist constitutes an insurance policy which, like an accident policy, does not prevent the accident but provides a valuable hedge against a major loss.

The Geologist at Your Service

A geologist should be consulted, as you would consult a doctor, in technical matters with which you are not familiar. He is equipped to offer counsel and services in a wide field of application to natural resources:

- Interpret and evaluate technical and scientific reports.
- Evaluate trends in use and market of the commodity.
- Evaluate reserves in the ground.
- Provide estimates of costs of development, extraction, transportation to market, milling, refining, and need for other services.
- Outline and direct economical methods of development.
- Provide required services, i.e.: supervise drilling, mapping, reports, and product analysis. Recommend other specialists where needed, i.e.: lawyers, engineers, landmen, drillers, and assayers.
- Act as adviser for meetings, conferences, litigation, contract negotiations. Obtain pertinent technical data where needed.
- Write geologic and engineering reports, including organizational prospectus reports and technical data in support of load applications.
- Provide assurance that valuable byproducts or other productive units are not being overlooked.
- Conduct research program directed toward development and exploitation of new areas and new commodities.
- Provide testimony as expert witness.

Services of a consulting geologist are no more expensive than professional specialists in other fields such as lawyers, doctors, dentists, or tax consultants. Employment of any of these constitutes an insurance against more costly complications. Your selection of these specialists is usually based upon their qualifications to handle your particular problem.



FOCAL POINT of Nebraska interest in the Denver basin is Allchin and Ansel fields, Kimball County.

Nebraska rakes in Denver basin chips

WESTERN NEBRASKA is grabbing the Denver basin success laurels back from Colorado this spring. The big news in this portion of the basin is Allchin field, opened earlier this spring in southern Kimball County.

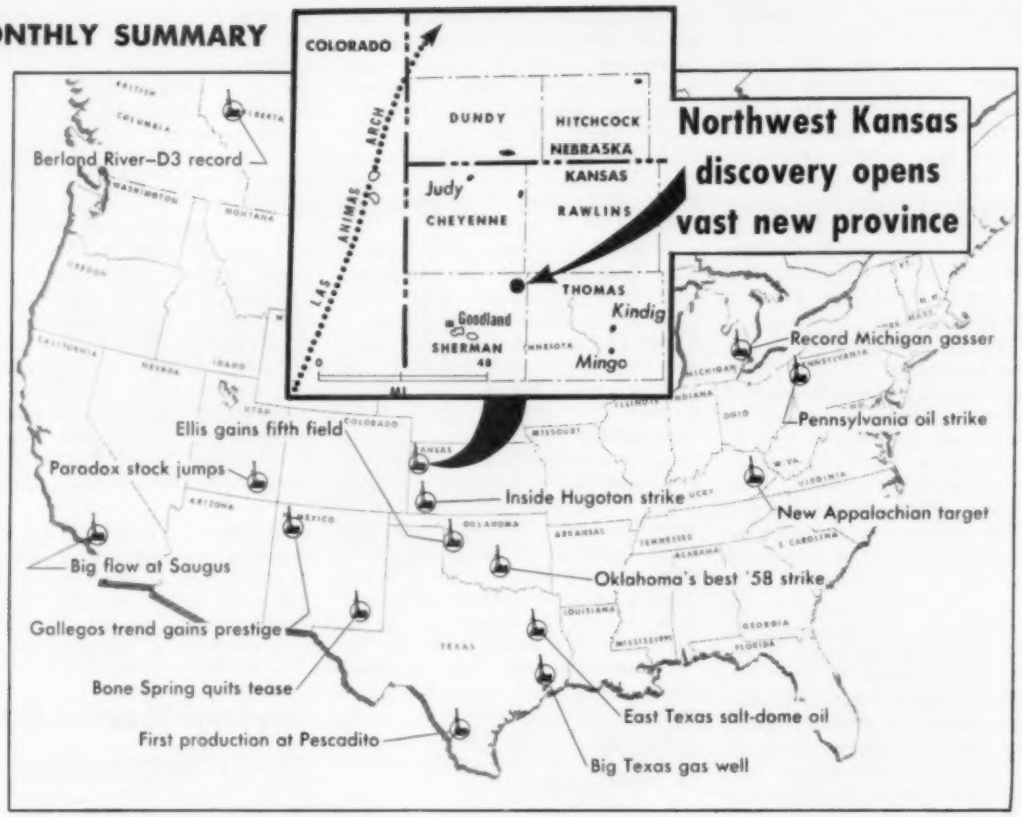
The discovery . . . British-American Oil Producing Co. opened the Dakota "J" sand field in April at 1 Allchin. That well flowed 940 bbl. per day.

The offsets . . . Last week British-American got 476 bbl. of oil on a 24-hour test at its 4 Petsch, an extension well. Perforations are at 6,524-34 and 6,540-44 ft. in the first and second benches of the "J" sand (Cretaceous). Gravity is 36.8°. At last report this well was flowing through casing at the hourly rate of 20 bbl.

An east offset to the field discovery well was completed for 768 bbl. of oil daily. It is the Warrior Oil Co. 1 Stout in SW SW SW 11-12n-56w.

Skelly Oil Co. has cored "J" sand oil shows at a third extension well, the 2 Woolsey in NW SW NW 14-12n-56w.

There was one dry hole drilled a couple of weeks ago to the west. Indications are that Allchin will eventually link up with Ansel field. Both fields are near the Colorado-Nebraska line. In April Braden Drilling Co. got a discovery well south of Ansel field. It swabbed about 60 bbl. of oil on late tests. The Ansel-Allchin area plus the recent North Bijou field discovery in Morgan County, Colorado, and excellent development of West Bijou this year have caused a real stir in Denver basin drilling interest in the past few weeks. Signs point to a big second half in this basin.



Operators find "buried treasure" in May as . . .

New frontiers open . . . old frontiers expand . . . and salt domes fall to the bit

THERE were three standout discoveries during the month—a flush oil hit in the Las Animas arch country of northwestern Kansas, a new East Texas salt-dome producer, and first production on the famed Pescadito salt dome in far Southwest Texas. All three of these discoveries will have a far-reaching impact on near-future drilling, particularly the Kansas strike —our choice for May honors.

Another strat trap . . . A five-pay Pennsylvanian discovery in Sherman County, northwestern Kansas, has given the central Mid-Continent region its most important discovery in many years. The flush hit is Phillips Petroleum Co.'s 1 Llanos, 31 miles south of nearest production.

Phillips found commercial shows in five zones of the Lansing-Kansas City, Marmaton, and Cherokee, all of Pennsylvanian age. At month's end completion tools were moving in for what appears to be the best discovery yet in the Las Animas country. The well is on the east flank of the big arch which runs northeast-southwest from Nebraska to the Sierra Grande arch in southern Colorado. There is very little production in this portion of Kansas, the closest being at Kindig and Mingo fields in Thomas County. Successful completion of this well will throw this northern portion of the Hugoton embayment open to strat-trap hunting. We may see the beginnings of another Oklahoma and Texas Panhandle play in the next few months.

BY JOHN C. McCASLIN
District Editor

Two more "wet" domes . . . Two oil-barren salt domes in widely separated Texas areas fell to the bit in May.

The Texas Co. uncovered the fourth producing salt dome in East Texas at its 1 Arthur Rabe, Freestone County. The Oakwood dome discovery flowed 141 bbl. of oil per day from perforations at 5,660-70 ft. The discovery is being tagged the most important in East Texas since Neches field was opened. Other producing domes in the region are Hainesville, Bethel, and Boggy Creek.

. . . **Pescadito tapped.** First production was opened on what is believed to be the country's largest salt dome —Pescadito. Ginther, Warren & Ginther, Halbouty, and Gulf Oil Corp. cracked this sprawling Southwest Texas salt dome at a Webb County wildcat, the B-1 O. W. Killam, 14 miles northeast of Laredo. The Wilcox discovery flowed 9 M.M.c.f. of gas daily and 35 bbl. of distillate per million at 5,994-6,032 ft. Additional drilling is under way on this 15-mile long and 9-mile wide structure.

Regional happenings . . . May was a sparkling discovery month in many of the nation's oil provinces. Some of the most important strikes of the year were reported in the Rockies, Oklahoma, California, and western Canada. Other developments included new success in the ancient Appalachians and rapid expansion of prolific Aneth field in Utah.

The Rockies . . . The San Juan and Paradox basins figured highly in the month's drilling events.

● First Dakota-Cretaceous production was added to the fast-moving Gallegos trend play between Bisti and Blanco fields in northwestern New Mexico. Pan American Petroleum Corp. 1 Randel flowed 5,496 M.c.f. of gas per day from perforations at 6,189-6,280 ft. plus 131 bbl. of oil per day from the regular field pay, Gallup sand, at 5,300-5,458 ft.

The Gallegos trend is probably the biggest exploratory event in the San Juan basin since Bisti. It wasn't until last year that interest began moving into this area. There are 66 producing oil and gas wells in the trend. There has been but one dry hole put down in the field itself so far—this fine record promises big things for the San Juan basin and its Cretaceous sands.

● Important expansion drilling is under way in the Aneth area of southeastern Utah. Pure Oil Co. completed two producers 1 mile south of Aneth, adding another big chunk to this huge field. South of these wells Phillips Petroleum Co. reportedly has four producers on its big block between Ratherford and McElmo Creek. Continental Oil Co. completed a discovery at 4 Navajo-B, offsetting Phillips block on the southwest. A year ago Shell Oil Co. estimated Aneth field reserves at 182 million barrels; current expansion drilling in the area seems destined to raise this figure by a large degree.

Oklahoma . . . Gulf Oil Corp. gave this state its most important discovery of the year at 1 McKinney Unit, a 3-mile extension of the ultradeep and prolific Carter-Knox Ordovician gas-condensate field in Grady and Stephens counties. The calculated open-flow potential at the well was 21,500 M.c.f. of gas per day and 2,250 bbl. of condensate. Gulf's well had 120 ft. of pay just above 15,000 ft. in the second and third Bromide sands.

● Magnolia Petroleum Co. opened Ellis County's fifth new producing area at 1 Schoenhals. This northwestern Oklahoma wildcat flowed 4 M.M.c.f. of gas and some distillate per day from the Morrow-Pennsylvanian sand at 9,638-9,785 ft.

Appalachian . . . Both gas and oil were found at a wildcat in Crawford County, northwestern Pennsylvania. Felmont 1 Forre, 6 miles southeast of Benedum-Trees' famous Ashtabula, Ohio, discovery, made 25 bbl. of oil daily and 300 M.c.f. of gas from the Medina-Lower Silurian Grimsby sand.

● A rapid-fire drilling play in the mountains of eastern Kentucky has 30 cable tools busy. New Puncheon Camp Creek field, near Jackson in Breathitt County, has 24 oil wells, 2 gas wells, and only 4 dry holes. Production is from the Corniferous lime of Devonian age.

Texas . . . One of Texas' biggest gas wells is reported at Big Hill West field in Jefferson County on the Upper Gulf Coast. Deep South Oil Co.'s 24 Security Bank had an absolute open-flow gage of 780 M.M.c.f. of gas per day with distillate production of 6¼ bbl. per million.

New Mexico . . . Bone Spring-lower Permian oil in the Delaware basin has always been found in teasing quantities. Pan American changed all this with an important discovery at its confirmation attempt to a Siluro-Devonian discovery in Sugart field, Eddy County. The well flowed about 500 bbl. per day, making it one of the best Bone Spring wells yet in the basin.

Michigan . . . Increased exploration in eastern Michigan is expected to follow a record-volume gas well in St. Clair County. Glen Mills 1 Baumgarten made 24,600 M.c.f. of gas daily from the A-1 Salina dolomite pay. There is strong evidence of a pinnacle reef in the area, but much more drilling is necessary to determine the potential of the structure.

Kansas . . . A prolific Mississippian oil pool was tapped inside vast Hugoton-Permian gas field in Haskell County. The southwestern Kansas wildcat, White Eagle Oil Co. 1 Eubank, made 502 bbl. of oil per day from the Chester sand at 5,439-45 ft. Location is 8 miles south of Pleasant Prairie field. Pleasant Prairie field has 15 oil producers with no dry holes.

Canada depth record . . . Berland River is Canada's deepest producing area. This northwestern Alberta gas area topped a mark made only a few weeks ago at Willow Creek. Shell Oil Co. and British American Oil Co. found gas in the Devonian D3 reef below 12,000 ft. Gas flow was as high as 27 M.M.c.f. per day on tests . . . the biggest flow from this zone in Canada. The Willow Creek discovery a few weeks back found oil at 10,676 ft. in the Dalhousie zone of the basal Blairmore-Cretaceous.

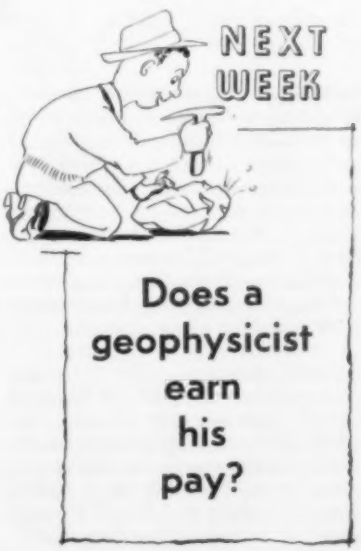
California . . . Union Oil Co.'s first extension to a new field discovery at Saugus in Los Angeles County flowed 1,500 bbl. of oil per day from the Upper Miocene. Location is about ½ mile northeast of the discovery well.

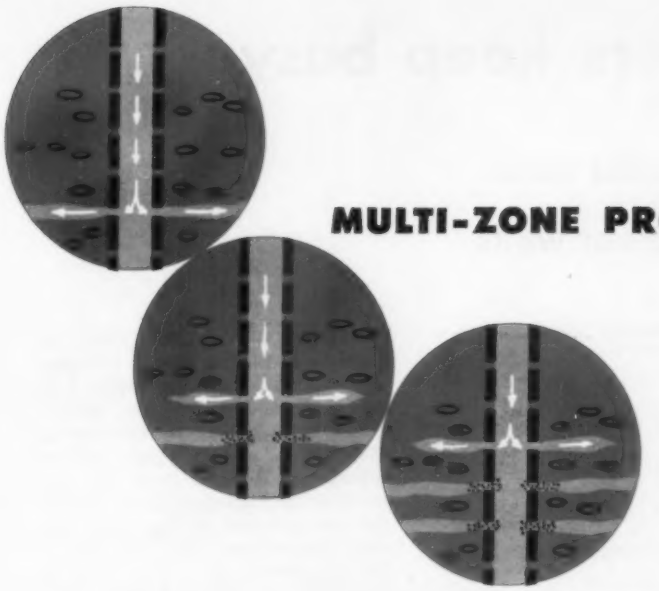
Eastern Kentucky stretches production

IN BREATHITT COUNTY on Shoulderblade Creek, Big Buck Development Corp. is extending production 4,000 ft. northeast at their 1 Dan Griffith.

Corniferous lime topped at 1,787 ft. and bottomed at 1,848 ft. filled up 1,400 ft. with oil.

However, first pumping tests resulted in only 25 bbl. of oil daily and operators plan to shoot. More drilling is expected in the immediate area.





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PERFPAC . . . rubber, rubber-covered nylon, or nylon balls that seat on perforations taking the most fluid and act as check valves.

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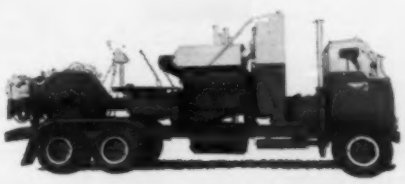

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Michigan oil finders keep busy

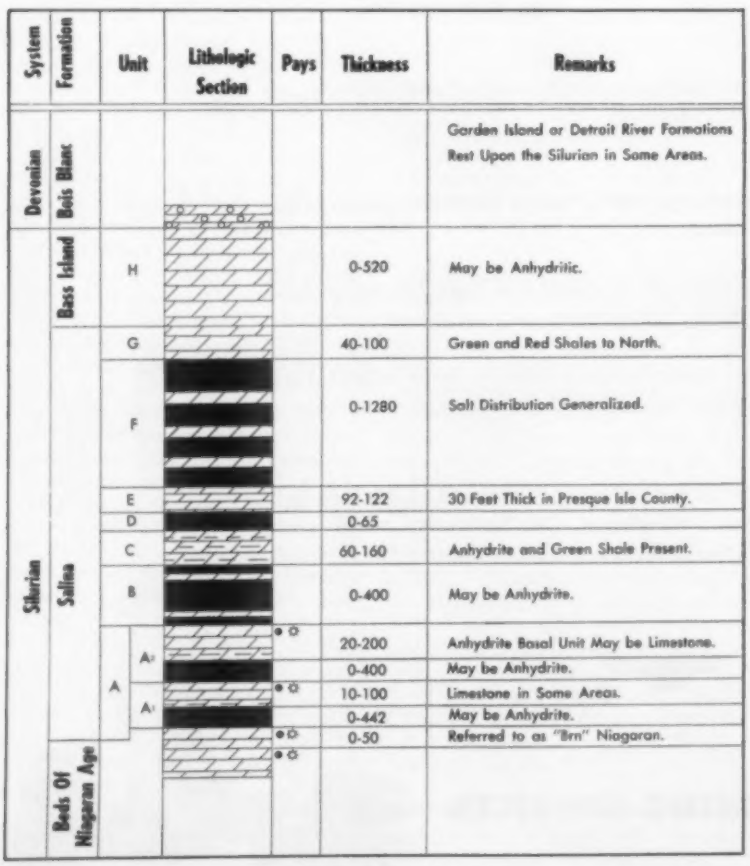
as drillers increase their success ratio in exploratory and development wells

TABLE 1—EXPLORATORY AND DEVELOPMENT WELL COMPLETION SUMMARY, 1956-1957

	1956					1957				
	Oil	Gas	Dry	Total	Percent success	Oil	Gas	Dry	Total	Percent success
Exploratory wells	12	1	152	165	7.9	13	5	132	150	12.0
Development wells	184	11	75	270	68.1	163	35	75	273	72.5
Totals	196	12	227	435	47.8	176	40	207	423	51.1

TABLE 2—POOLS AND PRODUCING UNITS IN SOUTHEASTERN DISTRICT

POOL	PRODUCING UNIT	TYPE OF PRODUCTION
Boyd	Al	Gas
Howell	Brn. Niagaran	Gas
Ira	Al and Brn. Niagaran	Gas
Marine City	Al	Oil
Northville	Al and Brn. Niagaran	Gas and some oil
Peters	Al and Brn. Niagaran	Gas and oil
Romulus	Al	Gas
St. Clair 18	Brn. Niagaran	Gas



GENERALIZED columnar section of Bass Island-Salina rocks in the Michigan basin.

EXPLORATORY DRILLING in Michigan in 1957 resulted in nine new oil fields, two new gas fields, four extensions, and three new pools—this is a 12% success ratio out of 150 wildcats drilled. Additional encouragement for the year was provided by the discovery of one oil pool and two gas pools through reworking older completions. Also, one new oil pay was found.

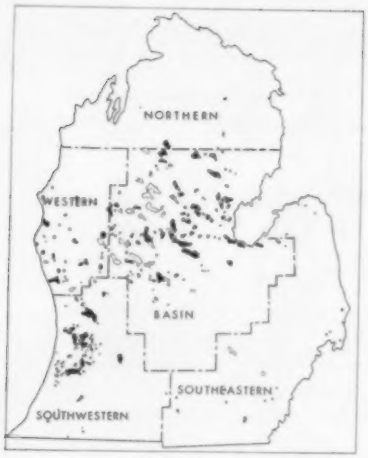
Footage . . . Footage drilled by exploratory and development wells decreased 52,757 ft. in 1957 from the previous year. Drilled footage in 1957 totaled 1,228,918 ft. Of this total, 388,763 ft. was attributed to wildcat wells and 840,155 ft. to field wells. Average wildcat footage was 2,592 ft.; average field-well footage was 3,077 ft.

Exploration . . . There was an increase in exploratory activity on the flanks of the Michigan basin where the producible formations are at a relatively shallow depth.

. . . Deep tests. Thirty-seven important deep tests were drilled in 1957. Of these tests, three reached the Prairie du Chien, one the Glenwood, seven the Trenton-Black River, one the Cincinnatian, two the Cataract, one the Clinton, one the upper Niagaran, eight the Salina, one the Bass Island, three the Bois Blanc, two the Sylvania, and seven the Detroit River. The tests resulted in the discovery of a Detroit River gas pool, a Detroit River oil pool, a Salina gas pool extension, and a new Trenton-Black River oil field. The success ratio for the deep tests was 10.9%.

. . . Geophysical activity. Little geophysical exploration was carried on during the year. Of the two gravity crews reported, one worked in Allegan

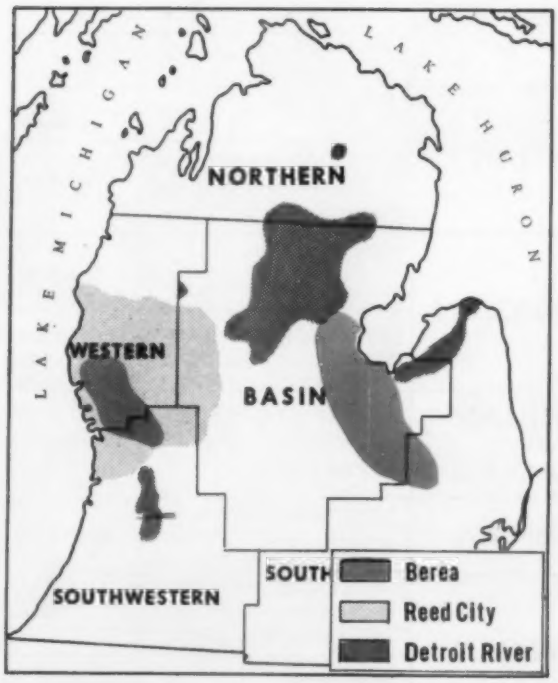
This is an abridged version of "1957 Summary of Operations Oil and Gas Fields" prepared by the staff of the oil and gas section of the State of Michigan, Department of Conservation, Geological Survey Division, as compiled by Lyle W. Price, Gordon H. Hautau, Robert M. Acker, and Robert E. Ives.

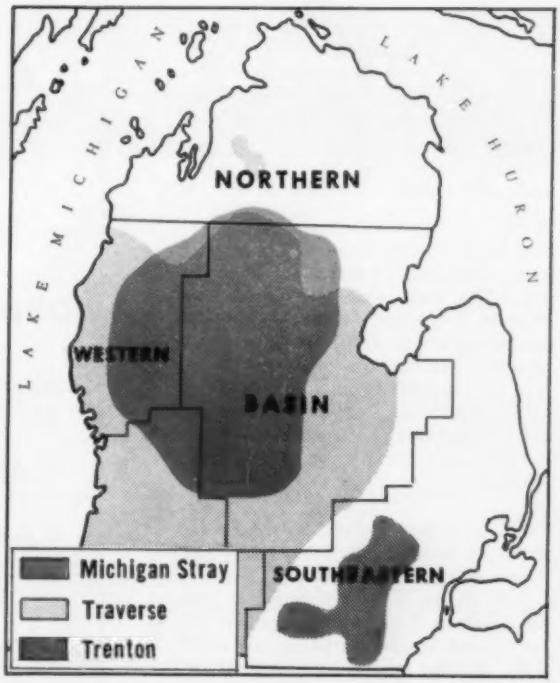


These are the fields which produce . . .

Oil and gas in Michigan

. . . and the producing areas by formation





and Ottawa counties, and the other in Arenac County.

. . . Subsurface. Subsurface geology continued to be the most efficient tool of exploration in Michigan. All but one of the discoveries was the result of this method. The lone exception was the Perry-Houseknecht No. 1 in Scipio Township, Hillsdale County—a nontechnical location.

Bass Island-Salina Group

Current and past successes in the basal units of the Salina group of Silurian age have commanded Michigan exploratory interest.

Central basin . . . Very few wells have penetrated the Salina group in this district. Of those that have, one deeper pool test in Kawkawlin field reported a substantial gas show. Gulf Oil Corp. 1 Bateston, Bay County, found gas at 7,760 ft. in the Salina A1 unit. The well, drilled in 1941, gaged in excess of 16 M.M.c.f. of gas daily. A blowout which ended in fire, plus mechanical troubles and a questionable market resulted in an unsuccessful completion. High cost of drilling and current successes at shallower

depths will hinder the development of the Salina group in the central basin area.

Southeast . . . Until recently, most of the success experienced in drilling rocks of the Salina group has been confined to this district. The principle pay zones have been the A1 and the Brn. Niagaran. Production has been confined in part to Niagaran and/or lower Salina reefs in some areas. This is particularly true in St. Clair County.

In 1957 these pools accounted for 23.4% of the gas produced in Michigan:

North . . . One near-commercial well was drilled in this area back in 1951. The well, Brazos 1 State-Chester, Otsego County, found oil in the A2, A1, Brn. Niagaran, and Niagaran at depths ranging from 5,918 to 6,662 ft. The well produced 2,752 bbl. of oil before abandonment.

Southwest . . . This area is currently receiving the major amount of interest with respect to the Salina group. There are four producing Salina pools in various stages of development. The three most important ones are Overisel, Dorr, and Salem, all of which are in northern Allegan County. Overisel Salina pool was discovered in 1956 and is producing gas from the A2 zone at 2,625 ft. The field had 38 gas wells by the end of 1957. Gas reserves for this field have been estimated in excess of 60,000 M.M.c.f.

West . . . Several Salina and deeper formational tests have been drilled here. Only one of these was successful. This well, Dow et al 1 Unit, Hamlin Township, Mason County, is producing oil at 4,212 ft. in the Niagaran. This well was drilled in 1952, and by the end of last year had an accumulative total of 59,579 bbl. of oil. Production is apparently from a Niagaran reef.

Prospects for 1958

Oil and gas activity this year is expected to maintain about the same level as last. The central portion of the Michigan basin will probably see the most drilling, but current strikes on the east, south, southwest, and west sides of the basins have stimulated new interest in those areas.

And currently . . .

Michigan outlook was brightened with a potential oil discovery in Ottawa County and a northwest extension to Scipio field, Hillsdale County.

Devine & Lang 1 Kok, NW SE SW 29-5n-14w, Zeeland Township, Ottawa County, flowed 32 bbl. 30.1°-gravity oil in 12 hours on ¼-in.

SYSTEM. SERIES	FORMATION. GROUP	THICKNESS
RECENT		
PLEISTOCENE	GLACIAL DRIFT	0-1000
"PERMO-CARBONIFEROUS"	"RED-BEDS"	
PENNSYLVANIAN	GRAND RIVER	80-95
	SAGINAW ☼	20-535
MISSISSIPPIAN	BAY PORT	2-100
	MICHIGAN	0-500
	"MICHIGAN STRAY" ☼	0-80
	MARSHALL	100-400
	COLDWATER	500-1100
	SUNBURY	0-140
	BEREA-BEDFORD ☼ ●	0-325
	ELLSWORTH-ANTRIM ☼	100-950
DEVONIAN	TRAVERSE ● ☼	100-800
	BELL	0-80
	ROGERS CITY-DUNDEE ● ☼	0-475
	DETROIT RIVER ● ☼	150-1400
	SYLVANIA	0-550
	BOIS BLANC	0-1000
SILURIAN	BASS ISLAND	50-570
	SALINA ☼ ●	50-4000
	NIAGARAN ● ☼	150-800
ORDOVICIAN	CINCINNATIAN	250-800
	TRENTON-BLACK RIVER ● ☼	200-1000
	ST PETER	0-150
OZARKIAN OR CANADIAN	PRAIRIE DU CHIEN	0-410
	HERMANSVILLE	15-500
CAMBRIAN	LAKE SUPERIOR	500-2000
ALGONKIAN	KEWEENAW	9800-35000
	KILLARNEY GRANITE	
	HURONIAN	2000+
ARCHEAN	LAURENTIAN	
	KEEWATIN	

GENERALIZED stratigraphic chart of Michigan basin showing producing formations.

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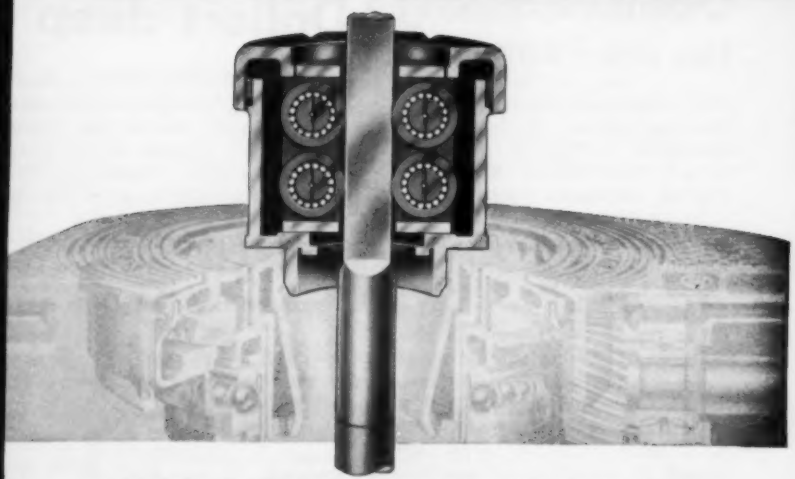

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BAASH-ROSS JOY

choke with drill-stem test in Salina A-1 dolomite at 2,783 to 2,834 ft. Hole was deepened to 3,052 ft. and cased for later completion.

Located 1 mile north of the Overisel (Salina A-2 dolomite) gas field, the Zeeland wildcat had best natural oil flow of record in current Southwest Michigan play. The test is one of five currently being drilled by Devine & Lang in a package farmout deal with Carter Oil Co.

Like other Salina-Niagaran testing now going on (2,800 to 3,000 ft.) in Southwest Michigan, Zeeland wildcat is located in an area previously drilled for 1,600-ft. Traverse production. Kok test logged A-2 dolomite at 2,613 ft., A-1 dolomite at 2,792 ft., and Niagaran at 3,026 ft. On drill stem it had gas to surface in 9 minutes and flowed oil in 4 hours.

A half-mile northwest extension of Trenton pay zone was indicated for Scipio field, Hillsdale County, with Adolph E. Rovsek 1 Wood, NW SE SW 3-5s-3w, Scipio Township, coring a 5-ft. dolomite oil-bleeding section at 3,780-85 ft.

Trenton zone was logged at 3,576 ft. Casing was cemented at 3,780 ft. and rotary moved off for completion spudder. Successful completion would give the field its best extension since discovery a year ago.

This well already has assured gas-condensate production in the Kansas City-Pennsylvanian lime and oil in the Oswego-Pennsylvanian. There was also gas possibilities in the Mississippi lime.

In Cimarron County's Southeast Griggs gas field, extreme northwestern Oklahoma Panhandle, The Texas Co. finished up at 1 Smith in C SE NW 25-1n-9eCM, adding the field's first oil well.

The Morrow discovery (Pennsylvanian) pumped 121 bbl. per day, 42° gravity. The same operator is drilling a south offset at 1 Nield, C SW NE 36-1n-9eCM. This field is in the very southeast corner of the county, just north of the Stratford fields of Dallam County, Texas.

A DEEP basement wildcat is slated for west-central Crawford County in northwestern Pennsylvania.

Oklahoma drillers tap pre-Permian

DEEP Morrow-Pennsylvanian production was opened in Texas County, Oklahoma at Republic Natural Gas Co.'s 9 Cities Service, SE SW 5-4n-13eCM, Oklahoma Panhandle.

The well was completed in the upper Morrow sand at 6,077 ft. for a potential of 8,500 M.c.f. of gas daily. The well found gas in the Council Grove-Permian at 3,244 ft. and tested oil at the hourly rate of 25 bbl. in the upper Cherokee-Pennsylvanian at 5,499 ft.

This is the first of a series of deep tests projected on the west portion of a block of 97,000 acres, 100% owned by Republic. A comparable well in the Morrow sand was completed on the east side of the block in 1955. The second well of the present wildcat campaign, No. 3 Julian, is 6 miles northeast of the new discovery; it is drilling at 3,995 ft.

New-pay discoveries continue to dot northwestern Oklahoma pre-Permian areas.

In Harper County's Holcomb area, Sinclair Oil & Gas Co. found Viola lime gas-distillate production at the 1 Holcomb in C NE NW 7-28n-22w.

Drillers deep in Pennsylvania

NEW DEEP DRILLING is planned for northern Pennsylvania. Benedum-Trees interests have a new location planned at 1 Kardosh in west-central Crawford County. Unless production is found they plan to go to basement at 7,500-8,000 ft.

Principal pay zones of interest in the area are within the Trenton, Lower Ordovician, and Upper Cambrian sections. If this well goes to basement, it will be the first well in Pennsylvanian to go to granite.

In Somerset County, Peoples Natural Gas Co.'s wildcat on Laurel Ridge is rumored to be a failure at total depth 7,936 ft. It is reported it drilled into a highly faulted zone.

PENNSYLVANIA SHALLOW WELL COMPLETIONS—FIRST QUARTER 1958

	Total	Oil	Gas	Dry	Water input	Storage wells	Footage	Drilled deeper	Drilled deeper footage
Allegheny	1	0	0	0	0	1	2,224	1 oil	556
								1 dry	1,308
Armstrong	19	0	19	0	0	0	57,930	3 gas	5,691
Clarion	2	0	2	0	0	0	5,423	0	0
Clearfield	1	0	0	1	0	0	1,005	0	0
Elk	1	0	1	0	0	0	2,315	0	0
Forest	4	0	2	2	0	0	5,735	0	0
Greene	1	0	0	0	0	1	2,949	1 gas	500
Indiana	8	0	7	1	0	0	24,377	3 gas	2,601
Jefferson	18	0	18	0	0	0	55,039	0	0
Lackawanna	1	0	1	0	0	0	3,927	1 gas	250
McKean	73	50	0	3	20	0	135,256	7 oil	315
								3 input	147
Mercer	1	0	0	0	0	1	815	0	0
Potter	1	0	1	0	0	0	1,965	0	0
Venango	7	7	0	0	0	0	5,157	0	0
Westmoreland	7	0	7	0	0	0	22,115	0	0
Total	145	57	58	7	20	3	*326,232	*20	*11,368

*Drilled deeper footage only included in total wells.

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MISSION LINERS keep down piston and liner packing costs as well as liner costs.

For normal to heavy-duty service, Mission Super-Service® Liners are recommended. They feature an accurate, uniformly induction-hardened bore that keeps down piston costs as well as liner costs.

For corrosive service, Mission offers Corrosion Resistant Liners fitted with hardened stainless steel sleeves. In certain areas, these liners have reduced combined piston and liner costs by more than 50 per cent.

In addition, all Mission Liners feature accurately machined outside diameters to assure the longest possible liner packing life.

MISSION SUPER-SERVICE® LINER PACKING feature zero-clearance confinement of packing rings. This exclusive construction has increased packing life so much that costs are often reduced by more than two-thirds.

Taken individually, the savings that result from using *any* of these Mission Pump Parts is substantial. When used together, savings pyramid and down-time is substantially reduced. This is the reason why Mission Pistons, Mission Liners and Mission Liner Packing make an unbeatable combination.

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HAULING GIANT OIL-FIELD EQUIPMENT—often over "roads" much tougher than this one—is all in a day's work with super-tough GMC Diesels. Secret is their extra stamina—engineered in at every stress point.

This rugged oil-field hauler has GM Diesel "muscles"

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GMC—America's Ablest Trucks

FROM ½ TO 45 TONS

Unnamed Field

Franklin County—
Well: F. R. Jackson and S. H. Killingsworth 1 L. C. Moore.
Location: Anna Willis Sur., A-518, 2 miles east Mount Vernon.
Pay: Pettet, 7,010-24 ft.
IP: Pumped 144 bbl. oil, no water, 37°-gravity.
Tops: Hill 6,682 ft., Travis Peak 7,171 ft.
TD: 7,268 ft.
Elevation: 447 ft.

Unnamed Field

Cherokee County—
Well: Shell Oil Co. 1 Tol Smith.
Location: Jose Pineda Survey, A-40, 3 miles northwest Jacksonville.
Pay: Sub-Clarksville, 4,649-58 ft.
IP: 2,350 M.c.f. gas, plus 6 bbl. condensate per million.
Tops: Sub-Clarksville 4,650 ft., Woodbine sand
TD: 4,891 ft.
Elevation: 524 ft.

North Garrison Field

Rusk County—
Well: Pan American Petroleum Petroleum Corp. 1 S. M. Adams.
Location: Henry Hilton Survey, A-369, 2½ miles north Garrison.
Pay: Hill sand (Rodessa), 6,056-60 ft.
IP: 1,350 M.c.f. gas, plus 5 bbl. condensate per million, 51°-gravity.
Tops: James 6,500 ft., Sligo 6,775 ft., Travis Peak 7,309 ft.
TD: 7,806 ft.
Elevation: 376 ft.

Sulphur Bluff-Smackover Field

Hopkins County—
Well: Grelling Estate 1 Bassham.
Location: J. A. Craft Survey, 2 miles south Sulphur Bluff.
Pay: Smackover, 9,324-29 ft.
IP: 13 M.M.c.f. gas, plus 75 bbl. condensate per million. 64°-gravity.
Tops: Paluxy 5,300 ft., Glen Rose 6,142 ft., Smackover 9,325 ft.
TD: 9,463 ft.
Elevation: 472 ft.

These East Texas wells open

New pools and new pays

EAST TEXAS continues to be a bright spot in the exploration picture.

A resume of discoveries completed during the month of April includes a Smackover gas-distillate well in northeastern Hopkins County; Pettet oil in eastern Franklin-Rodessa, gas-distillate in southeastern Rusk, and a sub-Clarksville gas well in Cherokee County.

Drilling in all East Texas fields has dropped sharply the last few weeks, but average monthly wildcat completions was 29 for the first 4 months in 1958.

Probably the most significant discovery was the Smackover well in Sulphur Bluff area of Hopkins County. The strike is Grelling Estate 1 Bassham, in J. A. Craft Survey, 2 miles south of Sulphur Bluff townsite. Calculated open-flow potential was 13 M.M.c.f. of gas a day plus 975 bbl. of condensate, or at the rate of 75 bbl. per million. Gravity of the condensate was 64°.

The Pettet oil opener in Franklin County is F. R. Jackson and S. H. Killingsworth 1 L. C. Moore, 2 miles east of Mount Vernon townsite in Anna Willis Survey. It made a pumping well, with potential of 144 bbl. of 37°-gravity oil a day and no water.

Shell Oil Co. 1 Tol Smith, in Cherokee County, opened sub-Clarksville production with a calculated open flow of 2,350 M.c.f. of gas, plus 6 bbl. of condensate and 7 bbl. of salt water per 1 M.M.c.f. The new field opener is in Jose Pineda Survey, 3 miles northwest of Jacksonville townsite.

Pan American Petroleum Corp. 1 Adams made a small gas discovery in the southeastern corner of Rusk County. Potential was 1,350 M.c.f. of gas, plus an estimated 5 bbl. of condensate per 1 M.M.c.f., from the Hill sand section of the Rodessa. The well is in Henry Hilton Survey.

Here's California news

CALIFORNIA'S coastal counties are currently witnessing a number of interesting wildcat projects, mostly by smaller operators in the shallower, heavy crude areas.

San Mateo County has two drilling projects attracting attention.

. . . Neaves Petroleum Development Co. is continuing its development drilling in its small productive area at LaHonda in the Coast Range Mountains. The latest Neaves test was being gun perforated in an interval above 1,265 ft. This test is in SE NE 17-7s-4w, about 5 miles northwest of Union Oil Co.'s small Oil Creek field.

. . . Cann & Wallis, operators, were slated to start drilling this week on their second wildcat effort in the Half Moon Bay region of San Mateo County. They recently quit a 3,033-ft. wildcat 1 mile west of the site of their new test.

Monterey County's top wildcats are these:

. . . Marport Oil Co. has five projects in various stages of development in areas just west of the prolific San Ardo field. Three were idle while one, B-3 Ansberry - Marport, was being logged to 1,340 ft. This test is in NW SW 2-22s-9e, some 8 miles northwest of San Ardo. The other Marport wild-

cat was still in the site staked stage.

. . . South of Marport's operations and about 7 miles due west of San Ardo, General Petroleum Corp. was running a whipstock at 2,108 ft. in a wildcat in the Pinyon Creek region of Monterey County.

San Luis Obispo County's wildcat tally looked like this:

. . . Honolulu Oil Corp. was drilling and coring below 8,790 ft. on a wildcat in the Avila-Pt. Buchon area 18 miles north of Guadalupe field.

. . . At Hausna, Verde Enterprises was coring below 7,705 ft. on a wildcat.

In Santa Barbara County, this was the top wildcat:

. . . C. W. Colgrove was drilling in sand and shale below 2,490 ft. on a wildcat in the Tepusquet region, about 8 miles northeast of the Cat Canyon field.

Ventura County was the most active in the coastal division with these tests:

. . . Shell Oil Co. was drilling below 6,047 ft. on a wildcat in the Harmon Canyon region 4 miles southeast of the huge Ventura Avenue field.

. . . Humble Oil & Refining Co. was drilling below 7,641 ft. on a test in the Piru region of Tapo Canyon.

. . . Standard Oil Co. of California, Western Operations, Inc., has called it quits on an 11,695-ft. wildcat in the Pole Canyon area near Fillmore in Santa Clara Valley. This unsuccessful effort was located about 3 miles northeast of Fillmore field production.

California highlights . . . Hancock Oil Co. missed with an effort to extend gas production in the Schohr Ranch region of Butte County with a 3,300-ft. dry hole 3 miles southeast of the nearest production . . . Davidor & Davidor's new gas pool discovery ½ mile northeast of production in the Beehive Bend-Willows gas field, Glenn County, tested at a 480 M.c.f. rate on a 1-hour drill-stem test of an interval at 5,850-5,945 ft. The operators were preparing to drill ahead . . . Just south of the Davidor well, the Kenson Corp. of Texas was running 5½-in. casing to 6,358 ft. prior to shooting for production in a test also ½ mile from the nearest Beehive Bend gas field producer . . . In the Vernalis region of San Joaquin County, Porter Sesnon et al. was completing a new gas pool discovery 1½ miles northwest of the nearest gas well belonging to Standard Oil Co. of California. This wildcat tested for 2,500 M.c.f. daily from perforations at 3,860-75 ft. and 3,880-85 ft.

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RESIDENT REPRESENTATIVE—CHICAGO AND MORE THAN 775 BRANCHES ACROSS CANADA

And to the north . . .

WITH the spring and winter rains at an end, northern California gas development is back in full swing. Focal point of activity is Willows-Beehive Bend field in Glenn County.

General Petroleum Corp. recompleted the Hill Elvidge 1-A, SE NE NW 9-19n-2w, a 1955 well, for 22,100 M.c.f. of gas per day from several zones. Average production of wells in this field is about 6 M.M.c.f. per day.

Last winter before the heavy rains set in General recompleted a well for 21,300 M.c.f. of gas per day. Last summer a record well was completed in this field by General. It flowed 36,880 M.c.f. of gas daily from two Cretaceous sand zones.

It is one of the biggest gas wells ever completed on the West Coast. This Cretaceous area in the Sacramento Valley has 50 producing gas wells.

NW Oklahoma gets deepest gas drilling

NORTHWESTERN Oklahoma's deepest hole went to the Arbuckle at 10,527 ft. It is Sunray Mid-Continent Oil Co. 1 Klinger, C SE NW 12-25n-26w, Harper County.

This deep geological wildcat, located at the south end of Laverne field, was plugged back to the Chester-Mississippian where it flowed 10,900 M.c.f. of gas daily from perforations at 7,526-41 ft.

Testing is now under way in the Morrow-Pennsylvanian at 7,380-90 ft. Nearest deep wells in this Sunray test are to the southwest in Lipscomb County, Texas Panhandle.

Tidewater well taps Texas' Palacios gas

A NEW GAS RESERVOIR across the fault from production in Palacios field was tapped by Tidewater Oil Co., 1 mile north of Collegeport, Matagorda County, Texas.

On a 4-hour test from perforations at 8,828-36 ft., the 3 State Lease No. 1 flowed at the rate of 4,300 M.c.f. per day plus an ungaged distillate flow on ¼-in. choke.

Directionally drilled from a location in the L. S. Harrison Lease on the edge of Matagorda Bay, the well bottoms out in the bay, about 952 ft. southeast of surface location. The well is about 2,600 ft. south of nearest production.

Schad Repays A Benefactor

PHILADELPHIANS and residents of the Delaware Valley know Henry G. Schad as "Mr. Port."

It's a tribute to his driving spirit—probably greater than that of any other single individual—which helped improve Philadelphia marine facilities so much the metropolis has become the country's No. 1 port.

Schad's work with Philadelphia water-front development is only a part of his various activities, chief of which is being a vice president, director, and general manager of transportation for Atlantic Refining Co.

But Schad derives personal satisfaction from his port - development work. It's proof that he has discharged a debt to a benefactor.

The benefactor was Stephen Girard, the highly successful merchant seaman whose philanthropies included the founding and endowment of Girard College. Its purpose is to educate fatherless boys who have the potential to benefit from a sound education but lack the means to acquire one. Girard's will also provided the then princely sum of $500,000 for the development of Philadelphia's water front. He regarded it as a project with great potential benefit to his adopted city.

Schad is a graduate of Girard College. He entered the school a year after the death of his father, a victim of the 1907 typhoid epidemic. Before that he had lived in Mahanoy City in Pennsylvania's hard-coal region. His father, John Schad, was an office supervisor for one of the coal companies.

When Schad graduated at 16, he left a notable record behind. He was second in his graduating class and had been a consistent honor student, a company commander in the school's World War I reserve batallion, editor of a school magazine, a member of the crosscountry team, and twice captain of the tennis team.

Rise is rapid . . . He was employed first as a stenographer by the International Freight Corp. in Philadelphia.

He also worked for Geyelin & Co. and the Black Diamond Steamship Corp. before joining Atlantic. Schad's first job with Atlantic was as a freight forwarder in the marine division. That was in 1925.

Eight years later he was made assistant manager of the traffic division and, a year after that, manager. On September 29, 1941, less than 2 weeks after his thirty-eighth birthday, he was made general manager of Atlantic's transportation department. He was elected to the board of directors in August 1943, and was made a vice president in May 1945.

In that capacity today he oversees the operation of 2,374 miles of crude-oil pipelines, 908 miles of products pipelines, and 22 ocean tankers as well as the company's communications.

Easy does it . . . Henry Schad is the direct antithesis of the obviously dynamic, energetic industrial executive.

His relaxed manner completely belies a remarkable capacity for getting things done. In addition to being a vice president and director of the parent company, he is an officer and director of four subsidiaries, Atlantic Communications Corp., Atlantic Pipe Line Co., Kuwait Tankers, Inc., and Tanker Transport, Inc. Shad also has other business interests.

The port his baby . . . While there is a remarkable list of accomplishments to his credit, one stands out above the others.

This is the success that crowned his efforts to improve the port. It was accomplished in his role as chairman of the Joint Executive Committee for the Improvement and Development of the Philadelphia Port Area. It repaid, in a way, Stephen Girard, the far-sighted founder of the school that educated Schad and one of the first advocates of a better port for the City of Brotherly Love.

Schad's interest in the port has been one of long standing. It was fired anew in 1953 by the collision of two Atlantic tankers on the Delaware. Nine lives were lost. It was the thirty-first collision at that point in the river in 3 years. It was grim, graphic evidence that if Philadelphia was to prosper as a port, the river would have to be improved.

His first act was to publicize the need through a fact-filled brochure, "The Delaware River—International Highway." It was the beginning of a well organized campaign to enlist municipal officials and state and national legislators. Schad stumped the area in behalf of river improvement and carried the battle to Washington.

The Delaware now has been dredged and Philadelphia receives more ocean-borne commerce than any other port in the United States.

But this isn't enough—Henry Schad would like to see the river dredged to Trenton. He and his committee are working toward that end. When it's accomplished, a dream of Stephen Girard will be fulfilled as will the obligation of one of the beneficiaries of his philanthropy.

●

Jerry D. Holmes, junior engineer with Cities Service Oil Co., has been transferred to Odessa, Tex., from Bartlesville, Okla.

Neilson Rudd has resigned as geologist with Magnolia Petroleum Co. to open consulting offices in Mount Vernon, Ill. Rudd did geophysical research at Carnegie Institution of Washington before joining Magnolia.

Personals

N. F. MYERS

Norval F. Myers, deputy refining coordinator for Standard Oil Co. (N. J.), has been appointed chairman of the board and managing director of A/S Esso-Raffineriet, Norge, New Jersey Standard refining affiliate in Norway. **Gustav A. Stein, Jr.,** a managing director of Esso Belgium, has been named a managing director and a member of the board of the new company. Company headquarters are in Oslo.

Hal R. Adams, northwest division exploration manager for Sohio Petroleum Co., has been transferred to Oklahoma City as staff assistant, exploration. He succeeds **R. A. Bishop,** who was recently transferred to Cleveland on 1-year assignment as staff assistant.

R. A. Malott, Shell Oil Co., has been elected chairman of the Pacific Coast district of American Petroleum Institute's Division of Production. Serving as vice chairman will be **H. E. Nissen,** Signal Oil & Gas Co., vice chairman for the Los Angeles Basin; **C. R. Ball, Jr.,** Richfield Oil Corp., vice chairman for the coastal area; **R. H. Torrey,** Southern California Gas Co., San Joaquin Valley; and **Grover Seburn,** Tretolite Co., of California, Coalinga - Kettleman. **C. R. Ball** of Ball & Black Supply Co., is district treasurer. **Elsie M. Edmiston,** API, is secretary.

A. F. Barrett of Billings, Mont., Rocky Mountain operations manager for Mobil Producing Co., has been elected to a second term as president of the Rocky Mountain Oil and Gas Association. **Walter W. Wittlinger** of Casper, Wyo., board chairman of Consolidated Royalty Co., was named treasurer. Other officers reelected at the association's convention in Denver were state vice presidents **J. L. (Mike) Dougan,** Equity Oil Co., for Utah; **F. H. Gower,** Denver oil operator, for Colorado; **Robert E. McMillen,** Ohio Oil Co., for Nebraska; and **Warren J. Hancock,** Billings oil operator, for Montana. **Warren A. Morton,** Rocky Mountain division manager for M.K.M. Oil Co. at Casper, was elected vice president for Wyoming. He succeeds **H. A. (Dave) True, Jr.,** True Drilling Co.

Paul G. Krick, area supervisor for Texas Pipe Line Co., has been transferred to West Columbia, Tex., from Clemville, Tex.

Robert S. Elias moves up from system gas dispatcher to chief system gas dispatcher for the Columbia Gas System. He succeeds **Samuel A. Chadwell,** who has retired.

Robert B. Smith, coordinator of research for Columbia Gas System Service Corp., has been named assistant director of research for American Gas Association. Smith has been on temporary assignment with AGA for the past year.

L. F. Uhrig, senior geophysicist in Shell Oil Co.'s Midland, Tex., area, has been promoted to area geophysicist. He replaces **Dr. R. D. Miller,** who has been appointed manager of technical information for Shell Development Co.

William N. Cones has resigned as vice president in charge of production for American Petrofina Co. of Texas to become an independent in Corpus Christi, Tex. Cones was manager of production and exploration for Panhandle Oil Corp. before its merger with American Petrofina.

James J. Trebilcott has moved up from assistant manager of operations to manager of operations for Michigan Wisconsin Pipe Line Co. He had been assistant manager for the past year and was administrative assistant to the vice president in charge of operations before that time. A graduate of the University of Missouri, Trebilcott joined Michigan Wisconsin in 1948.

E. C. Breene, general manager of International Petroleum Corp. in Caracas, Venezuela, will retire August 1. His Caracas post will be taken by **Henry Winter,** now Venezuelan coordinator for International at the company's Coral Gables, Fla., headquarters. Breene will join Winona Oil & Gas Co. in Tulsa after retirement from International. Winter previously spent 8 years in Venezuela as head of the economics department and western division manager for Creole Petroleum Corp. He moved to Coral Gables about a year ago from the New York offices of Jersey Standard, the parent company.

J. H. ABERNATHY

Jack H. Abernathy, vice president of Big Chief Drilling Co., has moved up to president succeeding **William T. Payne,** founder of the company. Payne becomes chairman of the board. **Sidney V. Hodges,** vice president, has been named president of Columbia Oil Co., producing affiliate, and also will be vice president in charge of drilling for Big Chief. Abernathy has been with Big Chief since 1945. Both Payne and Abernathy are past presidents of American Association of Oilwell Drilling Contractors and both have served on the National Petroleum Council. Payne is a past president of Mid-Continent Oil and Gas Association. Hodges was first driller with Big Chief and has been in charge of several record-setting crews for the company.

George Haas, assistant division production superintendent in Mount Pleasant, Mich., for Sun Oil Co., and **I. W. Hartman,** Mount Pleasant independent, have been appointed to the oil advisory board by the State Conservation Commission. Hartman was reappointed for a 3-year term. Haas succeeds **Harold Rudel,** Sun Oil.

Standard - Vacuum Oil Co. has named five regional vice presidents to coordinate operations in the Eastern Hemisphere. **James V. Pickering,** a director, has been assigned Stanvac's Far East region including Japan, Korea, Hong Kong, Philippines, Viet Nam, Cambodia, Laos, Thailand, Malaya, and Singapore. **Stanley W. G. Lehman,** also a director, will be vice president in charge of the South Asia region including India, Pakistan, Burma, and Ceylon. **Gerald L. McCoy,** veteran of Stanvac's Indonesian operations, will be in charge of Indonesia. **Rufus T. Burton,** former general manager of the South Asia marketing organization, has been named head of the Australia-New Zealand region including Papua, Australian New Guinea, and the South Pacific islands. **Charles E. Solomon,** managing director of Stanvac's marketing subsidiary in southern Africa, will be vice president in charge of the African region which includes southern Africa, East Africa, and the Red Sea area. Solomon will transfer to White Plains, N. Y., from Africa. The appointments become effective July 1. The new vice presidents will headquarter at White Plains.

Personals

D. H. Barran, head of supplies administration and a member of the coordinating committee of Shell Petroleum Co., Ltd., London, has been elected president of Asiatic Petroleum Corp. and Shell Caribbean Petroleum Co. Barran joined the Royal Dutch-Shell group in 1934 and has had assignments in Egypt, the Sudan, Ethiopia, Israel, and India. He had been with Shell Petroleum in London since 1947.

James H. Allen, formerly with Phillips Petroleum Co. in Texas and Oklahoma, has joined the engineering department of Arabian American Oil Co. in New York.

W. O. White, vice president of Rimrock Tidelands, Inc., has been named president and a director of Rimrock International Co. He will headquarter in New York.

August Goldstein, Bell Oil & Gas Co., has been elected 1958-59 president of Tulsa Geological Society succeeding **Parke A. Dickey,** Jersey Production Research Co. **P. C. Scruton,** Pan American Petroleum Corp., is first vice president, and **J. M. Ewers,** Alex McCoy, Inc., second vice president. Other officers are **Richard C. Beaveridge,** C. L. McMahon, Inc., secretary; **Henry Hobart, Jr.,** Kewanee Oil Co., treasurer; and **Albert L. Kidwell,** Jersey Production Research, business manager.

Arthur Eric C. Drake, a director of BP Trading, Ltd., has been elected a director of British Petroleum Co., Ltd. He succeeds **Robert Gillespie,** who will retire June 30. Drake was BP representative in the U. S. from 1952 to 1954.

Harry A. Trueblood, Jr., formerly president of Colorado Western Exploration, Inc., has been elected president and chairman of the board of Consolidated Oil & Gas, Inc., Denver. **Thomas F. Rittenberg** has been named a vice president and member of the executive committee of the board of directors for the company. **Saul A. Levine** has been elected secretary-treasurer of the company. Levine was formerly secretary-treasurer of Colorado Western Exploration, Inc., and Consolidated Rimrock Oil Corp. Consolidated Oil & Gas was formed recently by merger of the two companies.

Frank Allen, district superintendent in Cities Service Oil Co.'s gasoline division, has been transferred to Wichita Falls, Tex., from Blackwell, Okla.

George J. Sallee, vice president of American Maracaibo Co., has been elected a director. American Maracaibo's name will be changed to Felmont Petroleum Corp.

Wilber H. Mack has been elected executive vice president of American Louisiana Pipe Line Co. and Michigan Wisconsin Pipe Line Co. He will continue as director and general attorney of both companies.

Glen R. Ames, Tulsa division manager for Phillips Petroleum Co., will retire July 1. Ames was assistant division manager for the old Independent Oil & Gas Co. in Kansas City before its merger with Phillips in 1930. He has been Tulsa division manager for Phillips since 1934.

Robert W. Burch, superintendent of Shell Oil Co.'s Bryan plant near Pampa, Tex., has been named superintendent of the company's Elk City, Okla., gas plant. He succeeds **James D. Thompson,** now on special assignment. **K. A. Sorenson,** superintendent at Shell's Jumping Pound, Alta., plant since 1952, transfers to Pampa to replace Burch.

George M. Sullivan has been elected a d ministrative vice president of Continental Oil Co. He will also continue as general manager of marketing. A graduate of Montana School of Mines, Sullivan joined Conoco in 1925. He was division manager at Richmond, Va., and eastern regional manager in New York before transferring to Houston as general manager of marketing in 1953.

Humberto Suarez, formerly with General Geophysical Co. in New Orleans, has joined Yacimientos Petroliferos Fiscales Bolivianos, oil agency of the Bolivian Government, as geologist in La Paz.

S. J. Dickey, retired president of General Petroleum Corp., and **LeRoy Hines,** San Francisco consultant, have been elected directors of Bankline Oil Co. Hines was vice president in charge of oil development for Northern Pacific Railway Co. before becoming a consultant in 1954. Dickey retired from General Petroleum in 1948.

DEATHS

W. G. Hanrahan, 66, retired pipeline contractor, died May 21 in Dallas. Hanrahan began his pipelining career with the old Indiana Pipe Line Co. He later was with Ohio Oil Co., Texas Pipe Line Co., Standard Oil Co. of Louisiana, Oklahoma Natural Gas Co., and Foster Oil Co. of Tulsa. He also was superintendent of gasoline-plant construction for Sinclair Oil & Gas Co. He was vice president and general manager of Oklahoma Contracting Co. before beginning his own pipeline construction business in 1938. He retired in 1943.

Clifford D. (Shorty) Cobbett, district sales manager and former plant superintendent for Hill, Hubbell & Co., died recently in Pittsburgh.

Joseph Mullin, 47, superintendent at Husky Oil Co.'s Cody, Wyo., refinery, died recently of a heart attack while repairing his summer cabin in the Wyoming mountains.

Bruce Clark Kirtley, 47, Houston, petroleum engineer with Arthur G. McKee, died May 17 in Whiting, Ind., after a heart attack. Kirtley was with Ralph M. Parsons before joining McKee.

Frank G. Straka, 53, chief coordinating engineer of Universal Oil Products Co., died May 17 at his summer cottage near Fox Lake, Ill. Straka had been with UOP since 1922.

L. C. MacGregor, 73, Bay City, Mich., independent producer and director of the Oil and Gas Association of Michigan, died May 20.

James P. McKean, 72, retired superintendent for M. C. Parker Oil Co. in Bakersfield, Calif., died May 21 in Bakersfield.

George E. (Doc) Paddleford, 83, retired general superintendent for Huasteca Petroleum Co. of Mexico, died recently in Santa Barbara, Calif.

John Leland Shoemaker, 57, financial vice president of Service Pipe Line Co., died May 26 in Tulsa after a heart attack.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,231,200	DOWN	7,075	DOWN	1,190,062
Crude stocks	272,955,000	DOWN	1,077,000	UP	8,844,000
Completions	972	UP	90	DOWN	56
Refinery runs	7,331,000	DOWN	148,000	DOWN	579,000
Gasoline stocks	195,753,000	DOWN	2,554,000	UP	1,380,000
Kerosine stocks	20,709,000	UP	403,000	DOWN	3,226,000
Distillate stocks	84,464,000	UP	3,693,000	DOWN	7,068,000
Residual stocks	60,355,000	UP	852,000	UP	20,564,000
Four-product stocks	361,281,000	UP	2,394,000	UP	11,650,000
Total imports	1,323,800	UP	40,500	DOWN	99,900

More wells per million dollars

. . . but still not up to par

BY JOHN C. CASPER
Economics Editor

DRILLING so far this year has been off less than operators' income from crude. However, the income per well drilled is still high compared with most post-war years.

Crude produced in this country in 1957 averaged $3.10 a barrel, according to a published estimate of the Bureau of Mines. Since there were some price cuts in the last half of the year, the average for the first 5 months probably was about $3.11 a barrel.

Total crude production last year through May 24 amounted to 1,091,241,500 bbl. At a price of $3.11 a barrel, the total value of crude through May 24 was $3,394,000,000.

Crude-price cuts started about the middle of 1957. There were a few adjustments in the weeks following the price increase in January, but these merely revised abnormal postings that were not met by other buyers. Since the middle of 1957, about a third of all crude has had a price cut. The average reduction on the part that was cut amounted to a little over 13 cents a barrel. This represents an average cut for all crude of abou. 4.3 cents a barrel.

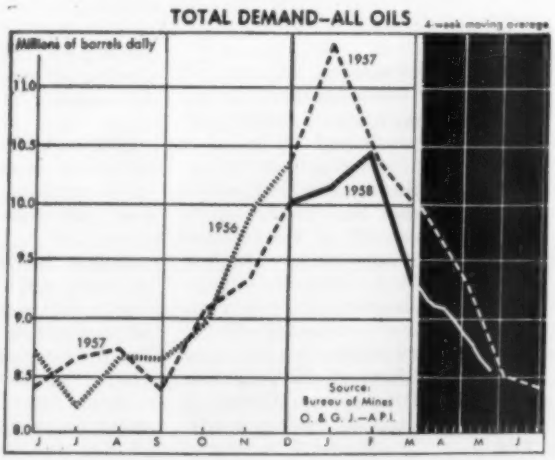
However, many of these price adjustments have been made since the first of the year. This means that the crude sold in the early months of this year did not receive the full cut. Since the reductions were spread over the entire period, it is estimated that the average price for all crude sold since the first of the year has been about 3 cents a barrel less than for the same period last year. The average would be $3.08 a barrel.

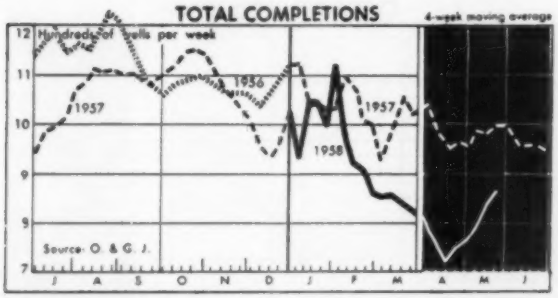
Production so far this year has totaled 935,594,450 bbl. At $3.08 a barrel, the gross income has been $2,882,000,000 compared with the $3,394,000,000 for the same period last year. Thus, gross income from crude is down about half a billion dollars or 15%. These totals include royalty payments, but the percentage decrease in the producers' portion of the total would be the same.

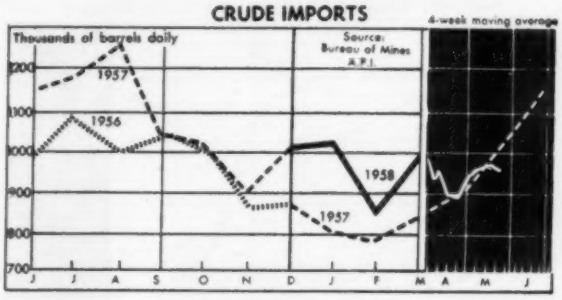
Through May 24, operators had drilled 18,207 wells compared with 21,120 in the same weeks last year. This is a drop of 13.8% compared with the 15% reduction in gross income from crude.

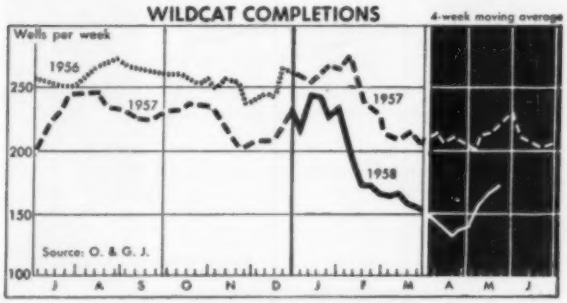
Translated into wells and dollars, this shows that one well was drilled for each $158,000 gross income from crude this year compared with $160,000 in the same period last year.

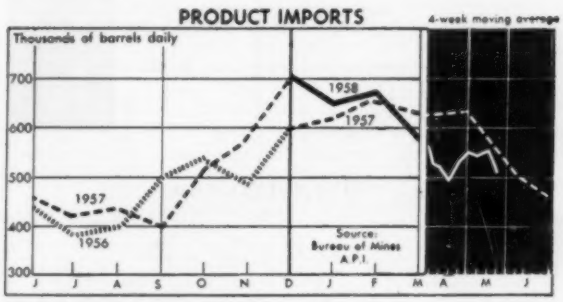
These figures indicate some improvement, but performance is still way off from the records set in recent years. In the 5-year period 1952-56, operators drilled one well for each $124,000 worth of crude sold. The range was from $119,000 in 1954 to $128,000 in 1953. Increased costs can't account for the jump from $125,000 in 1956 to $150,000 in 1957.









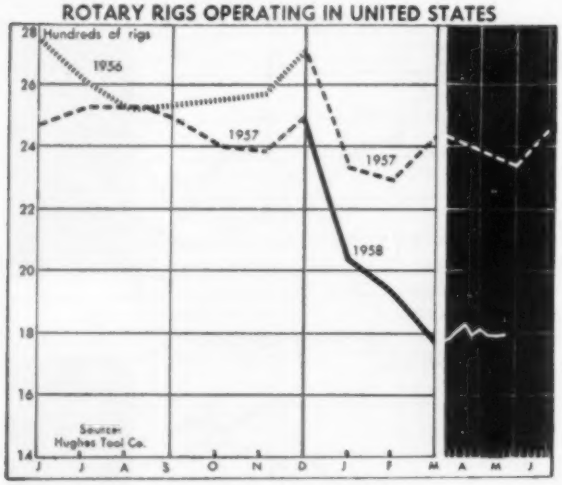


WEEKLY WELL COMPLETIONS . . . WEEK ENDED MAY 24, 1958

	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1958	1957	Total	Crude	Cond.	Gas	Dry	1958	1957
Alabama	0	0	0	0	0	0	0	29	48	0	0	0	0	0	10	19
Arkansas	12	7	0	0	5	0	45,964	255	375	3	0	0	0	3	61	60
California	28	14	0	3	11	0	142,139	725	865	10	0	0	0	10	145	212
Colorado	15	3	0	0	12	0	76,658	293	355	7	0	0	0	7	154	240
Illinois	39	16	0	0	23	0	96,864	732	956	8	1	0	0	7	154	232
Indiana	16	6	0	1	9	0	23,919	254	247	6	0	0	0	6	96	48
Kansas	77	29	0	5	38	5	268,104	1,397	1,646	21	2	0	1	18	279	316
Kentucky	22	10	0	8	4	0	43,434	358	546	1	1	0	0	0	43	105
Louisiana	54	27	6	1	19	1	457,448	1,291	1,478	9	0	0	1	8	187	263
North	10	5	0	0	5	0	42,512	435	497	2	0	0	0	2	69	55
South	34	15	5	1	12	1	321,877	675	696	6	0	0	1	5	103	171
Offshore	10	7	1	0	2	0	93,059	181	285	1	0	0	0	1	15	37
Michigan	9	3	0	2	4	0	29,973	150	159	3	0	0	0	3	49	67
Mississippi	7	2	1	0	4	0	73,136	151	147	5	1	1	0	3	78	70
Montana	5	2	0	0	3	0	24,953	140	134	2	0	0	0	2	59	50
Nebraska	15	6	0	0	9	0	88,978	252	320	6	0	0	0	6	118	179
New Mexico	24	17	1	1	5	0	126,555	736	785	4	1	0	0	3	101	109
West	4	2	0	1	1	0	22,339	343	289	1	0	0	0	1	45	43
East	20	15	1	0	4	0	104,216	393	496	3	1	0	0	2	56	66
New York	10	5	0	0	0	5	13,500	217	186	0	0	0	0	0	14	1
North Dakota	5	5	0	0	0	0	40,376	172	109	0	0	0	0	0	55	43
Ohio	23	9	0	8	4	2	56,678	400	409	1	0	0	0	1	4	3
Oklahoma	121	61	2	3	53	2	364,404	2,570	2,565	24	3	1	0	20	351	295
Pennsylvania	*145	57	0	58	7	23	337,600	184	337	0	0	0	0	0	6	33
Texas	310	163	17	9	115	6	1,348,800	7,119	8,790	66	7	1	1	57	1,473	2,287
District 1	13	6	1	0	6	0	39,719	388	493	6	1	0	0	5	149	171
District 2	16	4	3	2	7	0	124,165	289	289	5	1	0	0	4	76	116
District 3	40	18	4	0	18	0	247,378	510	725	10	0	0	0	10	107	236
District 4	19	6	2	0	11	0	103,910	473	574	4	0	0	0	4	144	221
East	21	11	2	0	8	0	83,899	493	495	6	0	0	0	6	138	149
District 7-B	44	22	1	1	20	0	133,376	925	1,188	14	3	1	1	9	263	449
West	85	58	2	1	20	4	394,510	2,118	2,480	15	2	0	0	13	296	382
District 9	51	28	0	1	20	2	122,729	1,426	2,008	3	0	0	0	3	257	526
District 10	21	10	2	4	5	0	99,114	497	538	3	0	0	0	3	43	37
Utah	2	2	0	0	0	0	11,866	181	70	0	0	0	0	0	32	40
West Virginia	17	2	0	11	4	0	49,968	269	240	0	0	0	0	0	9	11
Wyoming	16	11	0	1	4	0	93,297	292	324	4	2	0	0	2	85	112
Miscellaneous	0	0	0	0	0	0	0	40	29	0	0	0	0	0	34	24
Total U. S.	**972**	457	27	111	333	44	3,814,614	18,207	21,120	**180**	18	3	3	156	3,597	4,819
Total prev. week	882	412	24	65	359	22	3,846,884	.....	.....	180	22	5	3	150	.....	.....
Cum. 1958	18,207	9,050	452	1,375	6,908	422	77,389,177	.....	.....	3,597	342	60	116	3,079	.....	.....
Western Canada	21	13	0	2	6	0	98,263	889	982	7	1	0	1	5	326	269

*Shallow wells for first quarter.

ROTARY RIGS OPERATING IN UNITED STATES

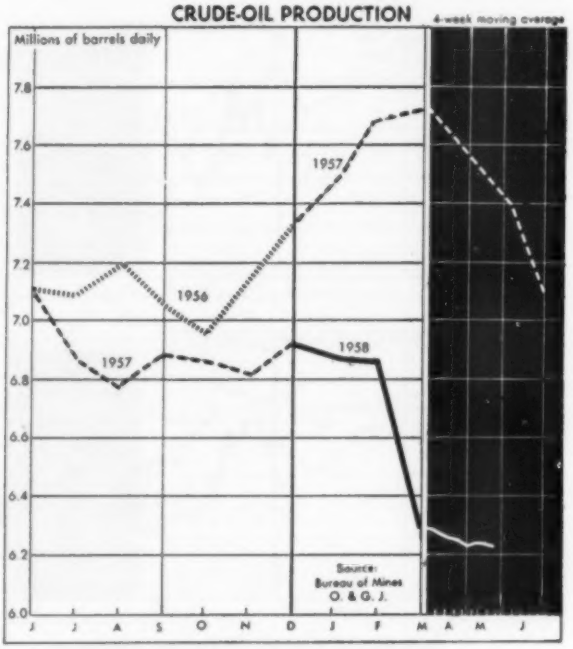


ACTIVE ROTARY RIGS*

	5-26-58	5-19-58	5-12-58	5-27-57
Alabama	7	5	5	11
Arkansas	11	13	13	32
Arizona	....	....	....	....
California	75	86	83	93
Colorado	30	26	24	42
Florida	1	2	2	1
Georgia	....	....	....	....
Idaho	....	....	....	....
Illinois	54	54	36	39
Indiana	10	8	4	7
Iowa	3	3	3	2
Kansas	128	114	129	150
Kentucky	7	6	4	9
Louisiana	281	277	272	437
North	36	34	21	56
South	201	202	213	280
Offshore	44	41	38	101
Maryland	....	....	....	....
Michigan	7	11	11	9
Missouri	....	....	....	1
Montana	21	22	22	34
Mississippi	37	33	34	29
Nebraska	30	23	30	38
Nevada	....	....	....	....
New Mexico	128	131	130	138
New York	2	2	2	1
North Dakota	33	37	36	22
Ohio	....	....	....	1
Oklahoma	188	190	196	210
Oregon	1	1	....	1
Pennsylvania	10	10	12	15
South Dakota	....	....	....	2
Texas	640	646	659	949
Gulf Coast	129	144	158	206
Offshore	4	4	1	5
West	264	266	274	373
North	203	195	195	312
East	40	37	31	53
Tennessee	....	....	....	....
Utah	37	38	34	42
Washington	....	....	1	....
West Virginia	5	6	5	1
Wyoming	52	48	50	68
Virginia	....	....	....	....
Total United States	1,798	1,792	1,797	2,384
Western Canada	160	128	108	202
Eastern Canada	2	2	2	1
Grand total	1,960	1,922	1,907	2,587

*Hughes Tool Co.

CRUDE-OIL PRODUCTION

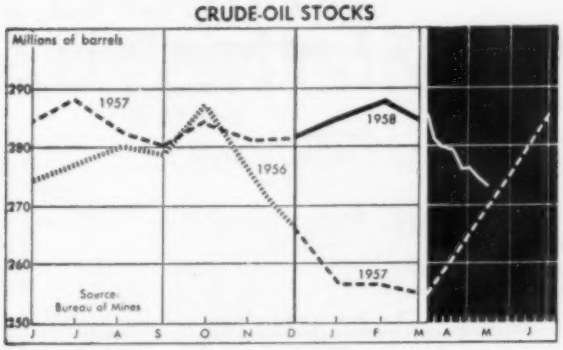


DAILY AVERAGE PRODUCTION FOR WEEK

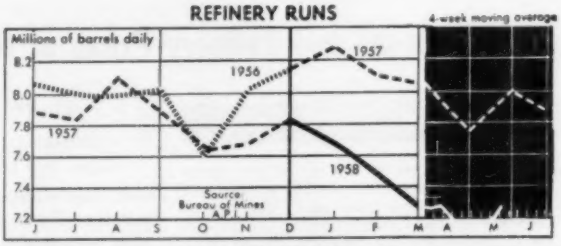
	May 24, 1958			May 17
	Crude oil	Lease condensate	Total	total
Alabama	14,950	.....	14,950	14,925
Arkansas	75,500	200	75,700	83,700
California	856,200	.....	856,200	858,800
Colorado	136,750	.....	136,750	137,375
Eastern	49,800	.....	49,800	49,000
Florida	1,275	.....	1,275	1,275
Illinois	220,900	.....	220,900	221,300
Indiana	28,600	.....	28,600	28,600
Kansas	†319,025	.....	†319,025	†327,500
Kentucky	42,500	.....	42,500	41,400
Louisiana	728,850	86,600	815,450	815,150
North	113,850	3,000	116,850	116,550
South	615,000	83,600	698,600	698,600
Michigan	25,800	.....	25,800	24,700
Mississippi	97,450	5,000	102,450	102,450
Montana	75,150	.....	75,150	74,350
Nebraska	48,100	.....	48,100	50,900
Nevada	100	.....	100	100
New Mexico	246,850	6,500	253,350	253,000
North Dakota	37,100	.....	37,100	39,600
Oklahoma	†554,200	.....	†554,200	†549,000
Texas	2,134,000	64,000	2,198,000	2,198,000
Dist. 1	45,000	400	45,400	45,400
Dist. 2	87,000	9,000	96,000	96,000
Dist. 3	315,000	32,000	347,000	347,000
Dist. 4	152,000	7,600	159,600	159,600
Dist. 5	25,000	500	25,500	25,500
Dist. 6	91,000	7,000	98,000	98,000
East Texas Field	116,000	.....	116,000	116,000
Dist. 7-B	122,000	100	122,100	122,100
Dist. 7-C	110,000	3,650	113,650	113,650
Dist. 8	775,000	1,600	776,600	776,600
Dist. 9	190,000	1,500	191,500	191,500
Dist. 10	106,000	650	106,650	106,650
Utah	72,500	.....	72,500	63,500
Wyoming	303,150	.....	303,150	303,500
Others	‡150	.....	‡150	‡150
Total U. S.	6,068,900	162,300	**6,231,200**	6,238,275
Change from previous week, down			**7,075**	
Canada	†411,900	.....	†411,900	†435,500
Total U. S. production—Jan. 1-May 24			935,594,450 bbl.	
Same period last year (plus cond.)			*1,091,241,495 bbl.	

*Includes 20,543,675 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

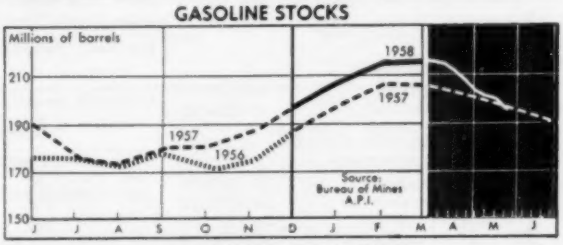
CRUDE-OIL STOCKS



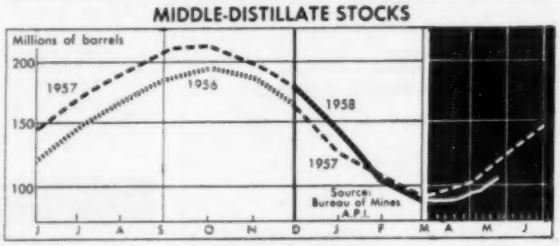
REFINERY RUNS



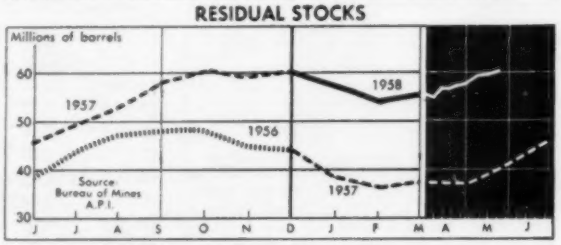
GASOLINE STOCKS



MIDDLE-DISTILLATE STOCKS



RESIDUAL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	5-17-58	5-10-58	5-18-57
Pennsylvania Grade	2,948	2,868	2,700
Other Appalachian	1,472	1,499	1,809
Illinois, Indiana, and Michigan	11,197	10,907	9,658
Nebraska and North Dakota	2,116	2,232	1,803
Kansas	10,694	10,430	10,591
Oklahoma	17,331	17,286	22,467
Arkansas	2,484	2,423	2,752
Louisiana	17,694	17,610	18,366
North	2,902	2,772	2,875
South	14,792	14,838	15,491
Mississippi, Alabama, and Florida	2,369	2,231	2,617
New Mexico	7,612	7,684	7,756
Texas	117,120	116,844	121,816
East Texas	7,623	7,407	11,819
West Texas	54,621	54,894	57,681
Texas Gulf	24,093	23,951	23,241
Other Texas	30,783	30,592	29,075
Wyoming	15,669	16,143	16,936
Other Rocky Mountain	7,519	7,727	6,248
California	38,959	38,904	25,615
Foreign	†17,771	19,244	12,977
Total	272,955	274,032	264,111

*Bureau of Mines. †Includes 3,900,000 bbl. in California.

API REFINERY REPORT—MAY 23, 1958

(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, May 1957: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,111	510.4	25.1	320.0	194.8	45,265	8,096	26,347	12,301	1,217	481.2	30.3	321.7	205.3
Appalachian:														
District 1	80	32.3	0.6	16.7	5.6	4,854	536	1,888	596	94	33.8	4.1	19.8	5.0
District 2	81	57.9	0.3	16.4	6.7	2,619	327	785	422	92	54.5	4.6	15.1	11.6
Ind., Ill., Ky.	1,360	686.4	68.0	294.7	148.4	36,579	4,238	13,688	4,815	1,425	688.6	67.1	271.7	155.8
Minn., Wis., Dak.	108	48.9	7.9	27.0	10.7	6,458	820	4,019	549	102	48.4	6.7	27.2	7.5
Okla., Kans., Mo.	729	394.6	11.3	166.3	20.7	17,251	1,013	7,549	803	700	385.7	19.0	162.9	22.8
Inland Texas	196	153.1	5.0	25.4	15.6	7,010	368	1,563	2,036	269	198.9	7.2	51.0	20.4
Texas Gulf Coast	1,632	845.8	80.0	432.2	168.7	25,459	2,503	9,011	4,689	1,877	904.4	78.8	467.8	226.7
La. Gulf Coast	606	330.4	38.3	144.4	34.6	10,193	1,520	3,070	1,225	652	353.5	45.1	190.3	50.9
N. La. and Ark.	91	36.3	5.0	21.3	7.3	5,101	776	1,806	155	83	27.6	3.6	21.9	4.7
Rocky Mountain:														
New Mexico	23	10.0	1.1	4.7	2.6	648	22	158	67	24	11.9	0.3	4.7	2.5
Other Rocky Mtn.	231	108.7	2.3	52.2	32.6	6,840	171	2,557	929	253	120.8	1.5	57.1	32.1
West Coast	1,083	453.6	.....	181.0	295.6	27,476	319	12,023	31,768	1,204	522.6	4.0	177.3	357.8
May 23, 1958	7,331	3,668.4	244.9	1,693.3	943.9	195,753	20,709	84,464	60,355	7,992	3,831.9	272.3	1,788.5	1,103.1
May 16, 1958	7,479	3,600.0	268.7	1,664.3	936.9	198,307	20,306	80,771	59,503	.....	.....	.....	.....	.....
May 24, 1957	7,910	3,871.7	268.3	1,798.9	1,083.4	194,373	23,935	91,532	39,791	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.25-11.50
Premium (98 octane)	14.00-14.25
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	9.75-10.25
Regular (92 octane)	10.00-10.50
Premium (97 octane)	11.375-11.75
Premium (98 octane)	11.875-12.50
California (rack) (Los Angeles):	
Regular (88 octane)	12.0
Premium (96 octane)	14.5
Premium (98 octane)	15.0
Caribbean area (cargoes):	
Regular (87 octane)	9.625
Premium (98 octane)	12.125

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.25-9.50
Diesel oil (58 d.i. and above)	8.875-9.125
Distillate No. 1	8.875-9.125
Distillate No. 2	8.25-8.50
Gulf Coast (cargoes):	
Kerosine 41-43	8.50-8.75
Distillate No. 2	8.00-8.25
New York Harbor (barges):	
Kerosine 41-43	9.35
Distillate No. 2	8.85
Diesel fuel, 48-52 d.i.	9.45
Caribbean area (cargoes):	
Distillate No. 2	8.125

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max 1% S)	$1.25-1.30
Gulf Coast (cargoes):	
★ Bunker C fuel	$2.20-2.25
New York Harbor (barges):	
Bunker C fuel	$2.57
Caribbean (cargoes):	
Bunker C	$2.25
California (rack):	
Bunker C fuel, Los Angeles	$2.45

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.5
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	24-26
200 vis. neutral (180° at 100°), 25 p.t.	22-24

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.47	....	....	....	....
15-15.9	2.52	....	....	....	$1.81
16-16.9	2.58	....	....	....	1.86
17-17.9	2.63	....	....	....	1.91
18-18.9	2.69	....	....	....	1.96
19-19.9	2.74	....	....	....	2.01
20-20.9	2.80	$2.75	....	$2.62	2.06
21-21.9	2.85	2.77	....	2.64	2.11
22-22.9	2.91	2.79	....	2.66	2.16
23-23.9	2.96	2.81	$3.44	2.68	2.21
24-24.9	3.02	2.83	3.46	2.70	2.26
25-25.9	3.07	2.85	3.48	2.72	2.31
26-26.9	3.13	2.87	3.50	2.74	2.36
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma (sweet), part of Kansas, North Dakota, W. Texas (sweet). Some Oklahoma available for 15 cents less starting 3-17-58 and other at 10 cents less on 4-1-58. †Low cold test crude. ‡Sour.

Effective dates of broad changes: California, 4-14-58; east of California, January 3-10, 1957; Pennsylvania Grade 4-16-58.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.15
Middle District	3.97
Southwest Pennsylvania	3.68
West Virginia	3.50
Buckeye Grade	3.50
Illinois Basin	3.00
Canada:	
Leduc-Woodbend	2.67
Redwater (Alta.)	2.56
Smiley (Sask.)	2.33
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26°-26.9°, Amuay*	2.55
Quiriquire, 16.0°-16.4°, Caripito	2.30
Lagunillas heavy, flat, Amuay or Las Piedras*	2.25
Bachaquero, flat, 15°-16°, Las Piedras*	2.08

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 35.0°-35.9°, Fao	1.98
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.49
Iraq, 36.0°-36.9°, Tripoli, Banias	2.49
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

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★ Gulf-U.S.N.H., clean (USMC—30%)	$2.00
Carib.-U.S.N.H., clean (USMC—55%)	1.22
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6—60' x 120' Austin Steel Buildings, walls and roof 3/8" Transite. Height to eaves—12' one side; 24' one side. Equipped with 10T and 5T Armington trolley cranes complete.
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Engines and pumps are complete.
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PUERTO RICO WATER RESOURCES AUTHORITY,
P. O. Box 4267,
SAN JUAN, PUERTO RICO.

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TRANSLATORS. Proven ability to translate technical material into fluent English essential. Attractive full time or free-lance arrangement. All languages of interest, particularly Russian. Send resumé to A.T.S., Inc., Drawer 271. East Orange, New Jersey.

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PETROLEUM ENGINEER: 33, married, 9 years experience; water flooding, production operations, workovers, evaluations, water treatment and disposal. Desires challenging position with management potential. Box K-704, The Oil and Gas Journal, Tulsa, Oklahoma.

OILMAN—32, wants demanding, responsible job where reward is commensurate with effort expended. Solid experience (7 yrs.) in leasing, titles, records, rentals, administrative and trades & deals. Have worked Gulf Coast, Mid-Continent and Rocky Mtn. areas, with emphasis on Gulf Coast. Have acquired ready knowledge of drilling and completion costs thru representing drilling contractor. Capable and willing to do much more than straight land work. B.S.—Ga. Tech, '48. Presently working toward B.S. in Pet. Engineering at night. Approximately 50 hours away from degree. Prefer Houston or Corpus Christi location. Sincerely believe that I will make the right party an excellent hand. All replies to Box K-718, The Oil and Gas Journal, Tulsa, Oklahoma.

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EASTERN CAPITAL seeking sizable producing oil-gas properties. Fair prices. Quick action. Box K-652, The Oil and Gas Journal, Tulsa, Oklahoma.

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REAL ESTATE

INDUSTRIAL PROPERTY, Farmington, N. M., 300 Ft. by 300 Ft. improved with Shop and Office Building. Centrally located. Coastal Plains Oil Co., 2711 S. Main Street, Houston 2, Texas. Phone: CApitol 3-4048.

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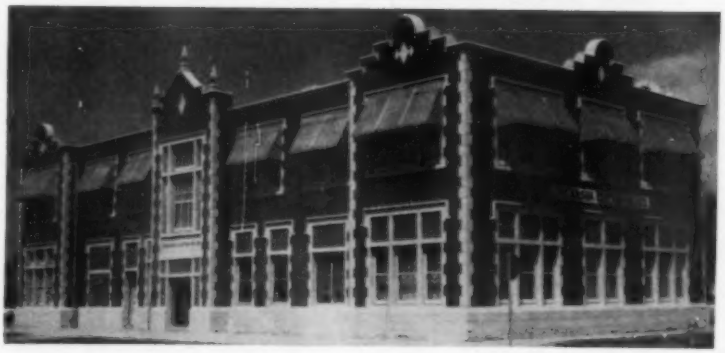
5000 ACRE STRUCTURE with five sands under 2500 feet: Need money to drill with my own tools. Box 650, Great Falls, Montana.

For Sale: Lot and Office Building
Location: Chickasha, Oklahoma



The office building shown is located on the southern half of a lot covering an entire block in length (approximately 400′ long) and 100′ deep. The office building proper is approximately 115′ long and 56′ deep. The walls, floors and partitions of the building are solid concrete, the outside faced with brick. There are seven large offices and two large storage rooms downstairs. There are ten large offices (one very large) on the second floor. Three offices on the south end downstairs and three offices on the south end upstairs have carpeting from wall to wall and draperies in the windows. There are two lavatories on the first floor and two on the second floor.

The stairway leading to the second floor and the halls on the second floor have marble wainscoating.

The entire area in the rear of the building and on the north side, extending about forty feet, is armor-plated asphalt and offers parking space for about forty cars. The north half of the plot is in grass. This lot is located two blocks north of main street in a residential area.

The building is air conditioned for winter heat and summer cooling.

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PRODUCING COMPANY would like to purchase good producing leases and royalties having some undeveloped locations. Any submitted must be accompanied with complete information and price. Box K-647, The Oil and Gas Journal, Tulsa, Oklahoma.

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LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that 76.48 acres of land within the known geologic structure of the Elm Grove and Rodessa fields in Caddo Parish, Louisiana, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 p. m., EST, June 11, 1958, when bids will be opened. Details of the lease offering, description of the lands, how and where to submit bids and bid forms may be obtained from the Manager, Eastern States Land Office, Bureau of Land Management, Washington 25, D. C., H. K. Scholl, Manager.

LEGAL

Sealed bids will be received until June 11, 1958, 2:00 o'clock P. M., Mountain Standard Time, and opened at that time in the Office of the Crow Indian Agency, Montana, for the leasing of 7,539.23 of tribal land located in T. 9 & 10 S., R. 38 E., T. 9 S., R. 37 E., T. 4 N., R. 33 E., and 946.65 acres of allotted lands located in T. 3 N., R. 33 E., T. 3 N., R. 34 E., Big Horn County, Montana, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of Crow Indian Agency, at Crow Agency, Montana.

LEGAL

Department of the Interior, Bureau of Indian Affairs, Jicarilla Indian Agency, Dulce, New Mexico. Sealed bids will be received until 3:00 P. M., Mountain Standard Time, June 19, 1958, and then opened at that time in the Office of the Jicarilla Indian Agency, Dulce, New Mexico, for the leasing of 141,560 acres of Tribal Indian land located in Sandoval and Rio Arriba Counties, New Mexico, within the Jicarilla Indian Reservation, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Jicarilla Indian Agency, Dulce, New Mexico.

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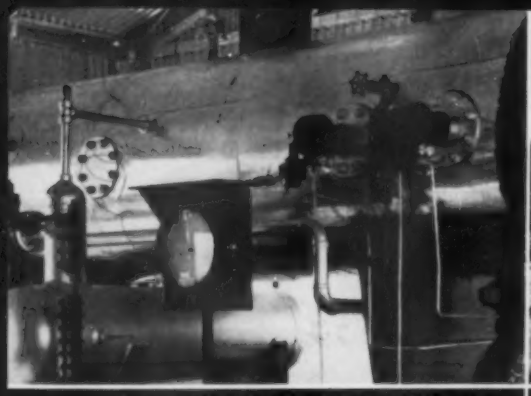

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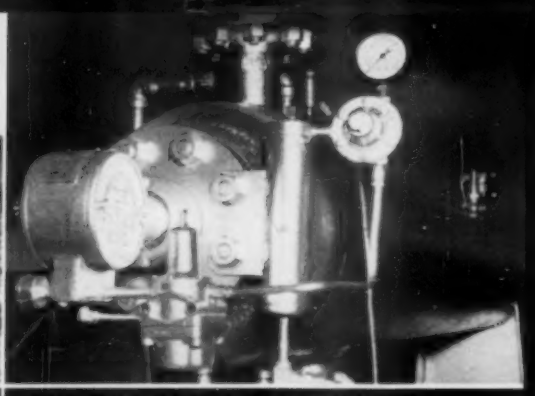

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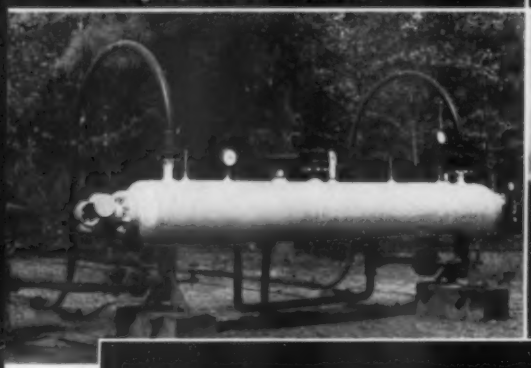

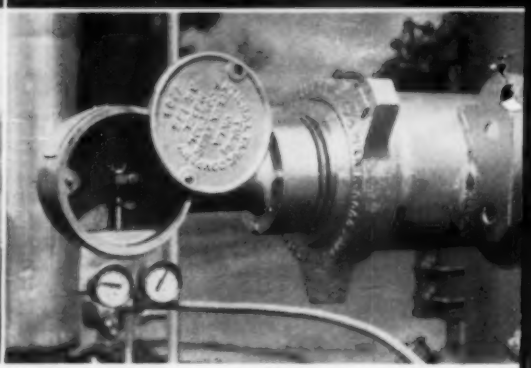

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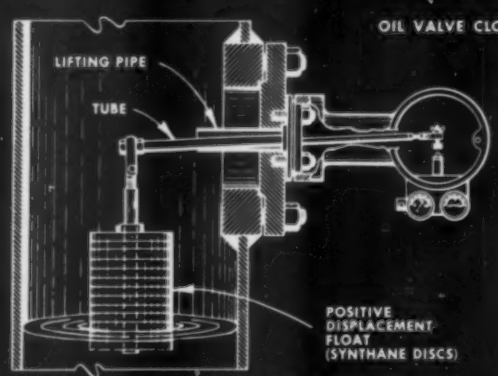

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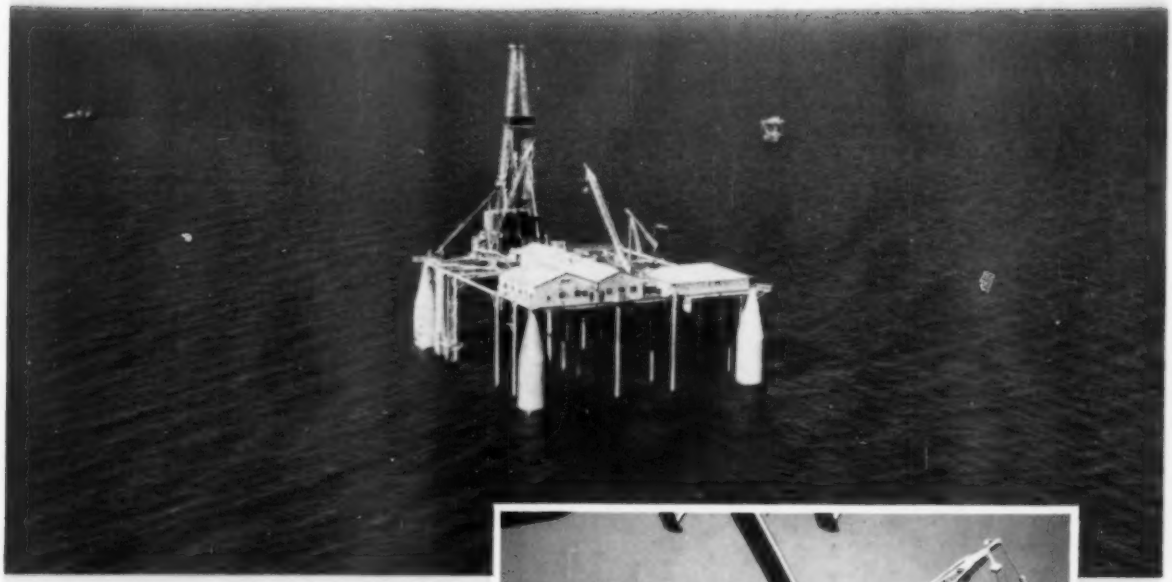

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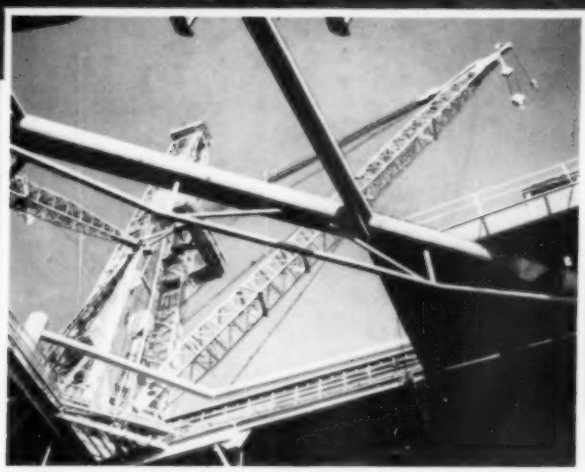

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